The Chemical Age

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The Trade Outlook

EVERY industry, and indeed every civilised country, is intimately interested in the probable future development of trade. There is no denying the fact that business men as a class are easily disturbed. They are apt to manifest disquieting symptoms upon the least provocation. We do not here specifically refer to this country, but to the world in general. The reason is probably because business has, within our lifetime, suffered so many violent fluctuations that it has become axiomatic that times of good or bad trade cannot continue indefinitely. Thus, that very circumstance that is the cause of optimism in times of trade depression becomes the cause of pessimism in times of prosperity. Perusal of the daily Press during the last few weeks would lead the reader to believe that the business man is the most unhappy of individuals. He is either bemoaning the bad state of trade, but keeping up his spirits by the comforting belief in trade cycles; or he is bewailing the fact that the prevailing good trade cannot last, being afflicted by that same, but now tormenting, belief in trade cycles. The smallest straws in the trade wind are sufficient to give grounds for depression. In the closing days of September there was a definite loss of confidence in America. Local reasons and the disturbing influences which are in operation throughout the world caused a trade recession in America (which was, for example, noticeable in steel production), together with the hoarding of gold by private persons. The rate of recovery in America had slowed down, though it had not yet arrived at stagnation.

The importance of this lies in the fact that a disturbance of trade in one country is apt to cause a loss of confidence in other countries. There have, in point of fact, been ugly rumours that inquiries in certain industries have diminished—by no means in America only—and that there are signs of a definite slackening in trade. Considering that even to-day we have still some 10 per cent. of our workers unemployed, that would be a serious possibility.

The facts, however, do not bear out the assumption that there is any real sign of recession. It was never more true than to-day that business is better than business sentiment. Fortunately, London is still the financial centre of the world, and London is pre-eminently to be congratulated on having kept its financial head during the recent disturbances that have rocked other countries. We have refused to be stampeded and we have been right. The Chancellor of the Exchequer, in his recent speech, has shown that this year, for the first time, we have done better than we did in 1929, which by common consent has been regarded as a basis peak year of post-war prosperity. He has shown that production has increased appreciably more than the increase in the volume of employment. This is no doubt the explanation of the high percentage of unemployed that this country still carries. It is a fundamental result of the work of the chemist and the engineer, and it will not be removed until either the world adjusts itself to expecting less hours to be worked per man, or until the chemist and engineer between them find new remunerative outlets for human activity.

It will be well worth the while of business men generally to ask themselves how far increased prices are likely to put a break on prosperity. There is no doubt whatever that many orders are being withheld to-day because prices have soared sufficiently to frighten the purchaser so that many purchasers are holding back in the hope of price reductions. A rumour of price increases immediately brings orders, and when the price increase has been realised the volume of orders falls off to a disturbing extent. Is it impossible to achieve some sort of stability, and cannot a means be found of stopping the vicious circle of price increase following trade improvement?

In all countries a time will come when the re-armament programmes will have been completed, and when the demand for many products will cease. One of the best methods of preparing to face this difficult period is by an increase in international trade. The Chancellor of the Exchequer was able to show that there has been a definite upswing in international trade during the past two years from the very low levels of the crisis period. But much remains to be done. Our imports from the rest of the world have steadily increased and our exports have also increased, but not to so great an extent. The world would be a happier and a busier place if anything like the same energy were given to restoring international trade as is now bestowed upon striving for the ideal of economic self-sufficiency and for the furtherance of contending political creeds. There are limits to the extent of progress in any country, or in any group of countries, so long as they seek to be self-sufficient and to act in isolation.

We have this satisfaction, for what it is worth, that just as Great Britain is the financial leader of the world, so we are in the forefront in endeavouring to open the boundaries of international trade. British commercial practice is based upon sound business codes, fair dealing, the furtherance of international trade and of international harmony, and monetary stability. It may be that with these weapons we shall yet be able to convince even the totalitarian states that ploughshares are more powerful than swords and contribute more to human welfare.

Notes and Comments

The Study of Chemical Engineering

EVER since chemical manufacture was first undertaken on a commercial scale, there has been the necessity for an expert who can design, construct and operate the manufacturing plant. For some time this need was filled by co-operation between the works chemist and engineer, but this arrangement did not work entirely smoothly, as was to be expected, and it was realised that such a specialised function could only be discharged by a specialist with the requisite individual training. The specialist is the chemical engineer; what constituted his correct training was not clear. The engineer did not recognise chemical engineering as any branch of his science and it was left to the chemist to acquire chemical engineering knowledge in post-graduate courses. As compensation for the engineer's lack of interest, the former had the smug feeling that a chemist can be taught engineering, but no engineer can be taught chemistry. Such training is not completely satisfactory; it produces a man who is primarily a chemist with a top-dressing of engineering, and the two subjects are not closely united until considerable works experience has been obtained. Bringing about this union at an early stage has now been effected. The University of London has instituted an undergraduate course in chemical engineering leading to a bachelor's degree. The course at the Sir John Cass Technical Institute has already been in existence for a year with conspicuous success; it was inaugurated officially by Mr. H. W. Cremer last week.

Margarine Production

THE most important tendencies in the margarine industry which have been in operation in the last few years are usefully summarised in the monthly bulletin of Agricultural Economics and Sociology. In 1935 there was a general increase in production which followed on the rise in the price of butter. The kinds of vegetable oils and fats used in manufacture vary from country to country, but great importance is now attached universally to the use of whale oil. In fact, it was thought that the supply of whale oil might be exhausted by too intensive exploitation, which persuaded several countries to agree to a limitation of whale oil output. Until recent years there was an increase in the use of imported new materials, but during the last few years this increase has not only been checked but also partly reversed. This feature is an interesting side-light on the international raw materials situation and is typical of many industries. Dependence on foreign sources is in many countries considered to be undesirable from more than one point of view. A reduction in the use of foreign raw materials was achieved by making it compulsory either to add butter to margarine, or to use other home-produced raw materials, or a tax preference in their favour.

Accident Prevention

IT has been estimated that the cost to industry of accident compensation is between 5 and 6 millions a year and the cost in time lost and disorganisation between 15 and 18 millions more. In addition, the Factory Inspector's report for last year was by no means satisfactory and showed that in many cases safety was sacrificed for increased production. Altogether the situation is not one which can be regarded with any degree of complacency, but industry as a whole is alive to the seriousness of the matter and remedial methods are being investigated by both individual employers and corporate bodies. Speaking at the Safety First congress last week, Lord McGowan, president of the National Safety First Association, said that research work into safety problems had not gone deep enough, and suggested that a University Chair for Accident Prevention be established. The suggestion brings into prominence an aspect of accident prevention which is largely overlooked, namely, that the maintenance of safe working conditions in the factory, the provision of safety devices and means for treating casualties, and, above all, the education of the individual workman to be "safety-conscious," requires the services of a specialist. The establishment of a University Chair in accident prevention would do much towards the training of such specialists, but Government schools for the training of industrial safety officers would be a most effective measure.

Need for Research

SIR HAROLD HARTLEY is another champion of that worthy cause, research. Addressing the annual conference of Vitreous Enamellers on Saturday last, he said that in the long run our prosperity must depend on our position in the world's markets where we had to compete with the products of countries such as Germany and the United States, where research and industry were close allies. The exhibition of new chemical products at Frankfurt last June showed the vast range of substitutes which chemistry is now producing. He held that the best insurance policy for the future of an industry was research, which would help it to foresee future lines of development, to solve its immediate problems, and to improve and cheapen its products. The need for research is certainly appreciated, but it is not appreciated to the fullest extent. Since the war there has been a steady growth in the number of research associations which are maintained by subscription from members of a trade, the results of the association's work being available to those members. Such co-operative research should be supported.

The Institute's Proposed Supplemental Charter

IN a proposed supplemental charter, the Institute of Chemistry intends to form a voluntary register of qualified chemists. The original basis for this register was to enable those enrolled on it to conform with the requirements of the Pharmacy and Poison Act. Its main function is, however, to make adequate provision for the future and to meet the requirements of further enactments which may arise. Apart from fellows and associates of the institute, the qualifications of registered members included in the register must be the same as those of an associate. A letter published on page 307 makes the suggestion that full members of the British Association of Chemists should be accepted as registered members of the Institute of Chemistry as the requirements for membership of the association are just as stringent as those of the institute. There is obviously a great deal to be said on both sides. On the one hand there is a register of qualified chemists on which most chemists will wish to be enrolled, and on the other, the very purpose of the institute has been to consider every case of proposed membership individually and not to admit candidates *en bloc*. It is hoped to obtain views on this matter, which is of interest to all industrial chemists, before the council of the institute considers the position in about five weeks' time.

International Congress of Industrial Chemistry

Delegates from Twenty-two Countries Meet in Paris

(FROM A SPECIAL CORRESPONDENT)

THE 17th International Congress of Industrial Chemistry opened at the Maison de la Chimie in Paris on September 27, under the presidency of M. Lecuyer, director of Industrial and Commercial Affaires at the Ministry of Commerce. In declaring the congress open, M. G. J. Painvin, chairman of the organising committee of the congress, after greeting the delegates from 22 countries, spoke of the role of chemists in industry. He stressed the importance of research in industrial development and the interest to industry which the encouragement of research presents. Sir Robert Mond, president of the Society of Industrial Chemistry, traced the history and evolution of the nickel industry; the meeting being concluded by a few general remarks by M. Lecuyer on the beneficial role of the chemist in general. The most important work of the congress was carried on in the sections, at which some 175 technical communications were presented.

A new method of quantitative analysis of carbon and hydrogen, presented by Hepner and Pojas; was described in the first section, devoted to analytical methods and equipment. Using a mixture of MnO_2 and Pb_3O_4 as a catalyst, the authors obtained combustion by Meulen and Heslinga's method at a temperature of about 400° C. A rapid method of analysis of the quantity of chromium in steel was also sketched by M. Misson. His method is based on the transformation of chromium into chromic acid in the presence of silver nitrate; the colour obtained being compared with standards of known chromium content prepared in the same way. Glazunov and Drescher presented a method for determining up to 1 per cent. of lead in tin by using an electrographic method with potassium iodide as reagent. The colour can be appreciated to within 0.01 per cent. of lead. A glucinium analysis method depending on the successive precipitation of various other substances which may be contained in admixture, and final precipitation of the glucinium by phosphate in an acetic acid medium, was presented by R. Gadeau. In this section also J. Barlot suggested that the presence of lead in a copper alloy might be determined by immersion in distilled water which attacks the copper-lead couple leaving a white precipitate.

The second section was given over to plant installation in its various aspects. To this section, A. Antoni suggested a method of refrigeration by evaporation of water in a vacuum and sketched its application in chemical plant. M. Leduc described a method of vulcanisation by the use of H.F. currents; using fixed and revolving electrodes, he has obtained a temperature increase of 50° C. per minute in the vulcanisation of rubber tubing, thus increasing the speed of the operation very considerably. Another electrical application, that of the photo-electric cell in automatic control, was described by M. Wilfart.

G. F. Jaubert noted that when caustic soda and ferro-silicon are treated with water for hydrogen production in a closed container, the first reaction is $Si + 2NaOH + H_2O = Na_2SiO_3 + 2H_2$. Owing to the temperature of some 250° C. which this reaction sets up, the neutral silicate reacts with the excess water and silicon thus: $Na_2SiO_3 + Si + 3H_2O = 2aHSiO_3 + NaOH + 2H_2$. This method permits the production of about double the quantity of hydrogen without the consumption of any additional soda.

Section 2a dealt with water purification and hygiene and included a description of the activities of the Water Pollution Research Board by Sir Robert Robertson. Other papers dealt with the importance of alcohol in the human organism in professional hygiene and the role of the doctor in the factory.

Section 3 was concerned with scientific research on solid fuels. Among the papers in this section was one on the separation of coal in a mixture of sand and water, especially for the selection of coal for hydrogenation purposes, presented by Charles Berthelot. M. Bertrand spoke of the possibility of coal as a competitor of petrol, suggesting that by separation of coal types suitable for special uses, such as gas producer fuel, might be obtained. A contribution by M. Barlot in Section 4 dealt with the pyrolysis of lignites, bituminous schists and asphaltic rock in CO_2 and in hydrogen, the former encouraging the formation of cresote and the latter that of the lighter hydrocarbons.

Metallurgical subjects were discussed in Section 5. The colours of the constituents of ferrous metals when examined microscopically were described by M. Malette and Mlle. Goldowski studied the corrosive effects of ethyl petrol on metals, and the possible remedies. Recent advances in the X-ray examination of metals were summarised by M. Reis.

In Section 6 K. Warming spoke of the progress made in the Hugo Petersen method of sulphuric acid production during the past 15 years, while S. Serra described the formation of sulphuric acid in lead chambers and the various phenomena which may take place. James Basset discussed the possibilities of reactions at high pressures, mentioning the manufacture of potassium iodate by combination of the iodide with oxygen at 17,000 lb. pressure and 425° C., and the formation of nitrates under similar conditions.

Section 7 dealt with building materials of all types,

Some of the British delegates to the International Congress of Industrial Chemistry in Paris. Sir Robert R. Mond, president of the Society of Industrial Chemistry, is in the centre of the group which includes Mr. W. A. S. Calder, Sir Gilbert Morgan, Professor G. G. Donnan and Sir Robert Robertson.

notably with the manufacture and utilisation of cement. M. Nicoletis studied the manufacture of Portland cement from calcium sulphate and Mary and Lepingle discussed fineness of the cement and its effect on the permeability of concrete, and melted cement mixed with mullite used in refractory masonry. Batta and Lefebvre described their experiments on the action of magnesium sulphate on mortars with a basis of puzzolana and slag. Section 8 treated with glass and ceramics, mainly in their application as building materials.

Section 9 was given over to organic products. Among the papers presented was one by M. Pavlik on the viscosity of nitrocellulose. Studying the decrease in the viscosity of nitrocellulose with a nitrogen content of 10.6 per cent. to 12.3 per cent., he points out that the viscosity can be reduced by preparation in acid, alkaline or indifferent media at high temperatures. Mechanical studies showed that even for slight drops in viscosity, relatively important reductions occurred in tensile strength, elongation and plasticity. Detrie and Mlle. Lelievre proposed perfections in the Kljatschina method for the study of the secondary alkaloids of opium. They pointed out, notably, that the opium can be more rapidly attacked by the use of hot dilute acetic acid followed by the addition of a small quantity of cold concentrated hydrochloric acid.

Synthesis of Vitamin B2

Hepner, Kelner, Simonberg and Mlle. Kaltman presented a paper dealing with the condensation of 2.6-dioxy-4.5-diamino-pyrimidine with diacetyl aldol, which yields a product named by the authors "pseudo-lumichrome." It was pointed out that this synthesis is a model of the natural synthesis of vitamin B2. It was stated that by orthocondensation of the same diamine with ortho-quinone a new method for the synthesis of the flavines is obtained, while by condensation with alloxanes the authors obtained a new series of compounds which they call purpuroflavines. The Ets. Chiris presented a paper on essential oil of the buds of the *Ribes nigrum L.*, giving the results of analysis of the semicrystalline benzene extract. Stoll and Scherrer described the concrete essence of oak moss which they succeeded in extracting from lichen by means of ether. The essence has been separated into groups of substances, some of which have been identified.

In Section 10 (oils and fats) Wolff and Guellerin gave a description of their experiments on unsaponifiable substances and lecithin in fatty substances. They noted that fats and oils neutralised with soda or filtered through bleaching clay, presented little change in unsaponifiable matter content. Lecithin content was much reduced by neutralisation, while filtration through bleaching clay sometimes removed as much as 90 per cent. of the lecithin in the oil. Treatment of oils in which an excess of lecithin had been dissolved showed that this method could be used, where necessary, to increase the lecithin content of refined oils.

Section 11 dealt with resins, rubbers, paints and pigments. J. Duarry proposed the impregnation of textiles with latex in an autoclave, as wear on the textile is considerably reduced by this treatment, especially for use as belts. Taradoire reported that sulphur has no action on the drying of paints or on the behaviour of the dry film, except when metallic pigments are present. Delcroix suggested, in Section 12 (paper, textiles and plastics) that the addition of specially prepared cellulose to paper pulp made sizing by the ordinary methods unnecessary and gave better results. Rolland attributed the stains sometimes found in rayon tissues the warp of which has been sized with linseed oil, to decomposition of peroxides formed during oxidation of the oil. A sure remedy in the case of acetate tissues is, he proposed, to apply a reducing treatment with formol before or during the normal removal of the sizing.

To Section 13 (tanning), Chambard and Garnot explained that the low molecular weight of sodium chloride and its high solubility rendered it the best antiseptic for the preservation of hides, though certain other salts may present greater antiseptic power in equimolecular solutions. Sections 14 (fermentation), 15 (food), 16 (agriculture), and 17 (organisation) contained little of note.

A session commemorating the foundation of the Society of Industrial Chemistry was held under the presidency of Monsieur Jules Jullien, Under Secretary for Technical Education.

Sir Robert Mond sketched the history of the Society of Industrial Chemistry during the past 20 years. M. F. Giordani of the Reale Accademia dei Lincei read a speech prepared by Prof. Paravano on the influence of the Society of Industrial Chemistry on international relations. Such organisations as the Society of Industrial Chemistry were, he felt, an important factor in the exchange of knowledge, as well as leading men of all nations to a better understanding of each other. Sir Robert Mond then introduced the new Honorary President of the Society, M. Auguste Behal, member of the French Institute and of the Academy of Medicine, who then presented the new honorary members of the society.

Import Trade of India

Appreciable Increase in Trade in Chemicals

THE increase in India's imports during April to June of this year was spread over a wide range of commodities, including chemicals, drugs and medicines which increased by Rs.36 lakhs, according to a survey of the import trade of India published by the Department of Overseas Trade.

Following a reduction in the trade in chemicals and chemical preparations (excluding manures and medicines) in the year ended March, 1937, the first quarter of the current financial year showed an appreciable increase from Rs.62.4 lakhs to Rs.86.2 lakhs. Increases were registered for acids, bleaching powder, disinfectants, potassium chlorate, sodium carbonate and sulphur.

There was some increase in the total trade in drugs and medicines from Rs.42.2 lakhs to Rs.53.3 lakhs, spread over the main categories. In proprietary and patent medicines, the value of the imports advanced from Rs.14.4 lakhs to Rs.16.1 lakhs. There was a sharp advance in the value of trade in dyes obtained from coal tar from Rs.55.8 lakhs to Rs.88.9 lakhs. The whole of this advance was enjoyed by Germany whose sendings advanced from Rs.36.8 lakhs to Rs.66.6 lakhs. The share of the United Kingdom was practically stationary at Rs.7.3 lakhs.

Carbide Plant Site

Government Committee's Report Now Complete

THE report of the Government Committee appointed to consider schemes for the manufacture of calcium carbide is now understood to be complete and in the hands of the Minister for the Co-ordination of Defence.

The report deals with three different proposals based on the production of the necessary electric power from hydro-electric plants in the Highlands, from coke oven gas in the West of Scotland and from low-grade fuel in South Wales. The financial and technical features of the various schemes are believed to be very fully discussed.

Two companies most closely concerned are the British Oxygen Co., Ltd., and Campbell, Binnie, Reid and Co., Ltd., of Hamilton. The latter has prepared the proposals for utilising the surplus coke oven gas available in Lanarkshire from existing and projected coke oven installations. It is reported that no Government communication has as yet been received by either of these companies concerned about the findings of the committee.

The committee, which was set up "to consider and report as to the relative advantages of any schemes which might be submitted to them for the production of calcium carbide and allied products in the United Kingdom," is composed of Sir Ernest Harvey, late deputy governor of the Bank of England (chairman); Mr. Peter Bennett, vice-president of the Federation of British Industries; and Mr. T. Lodge, late member of the Commission of Government in Newfoundland.

Letters to the Editor

Proposed Supplemental Charter of the Institute of Chemistry

October 10, 1937.

SIR,—The main proposal embodied in this charter is roughly to form a voluntary general register of qualified chemists, who will agree to submit themselves to the disciplinary clauses of the Institute Charter, in order to fulfil the requirements of the Pharmacy and Poisons Act. This is obviously a matter which vitally affects the whole profession and particularly the industrial chemist.

I enclose a copy of some sugestions I have made to the Council of the Institute, and I hope that there will be a discussion in your columns, such as the importance of the subject calls for, so that there may be an opportunity for a general body of feeling to develop in the profession, which will be a guide to the meeting of the Institute at which the matter will be decided, in about five weeks time.—Yours faithfully,

T. P. DEE, F.I.C.

Woody Green,
Darley Park Road,
Derby.

[Enclosures.]

To R. B. Pilcher, Esq.,
Institute of Chemistry, London, W.C.1.

September 21, 1937.

DEAR MR. PILCHER,—The Council's Proposed Petition for a Supplemental Charter is avowedly more particularly intended to please the Universities. I wish to put the following suggestions to the Council, with the object of improving the unity of the profession by bringing into the Institute a considerable body of industrial chemists:

1. That Full Members of the British Association of Chemists should be accepted as "Registered Members" of the Institute of Chemistry, on signing the necessary Declaration, without further inquiry as to their qualifications.
2. That the B.A.C. be invited to appoint representatives to confer with representatives of the Institute, with a view to arranging that members of the B.A.C. might become "Registered Members" of the Institute without paying an extra subscription. (Alternatively, the B.A.C. might make a small addition to the subscriptions of members wishing to take advantage of this privilege, and pass it on to the Institute.)

While they naturally differ from those of the Institute, requirements for membership of the B.A.C. are such that the standard is practically the same as for the A.I.C.

The proposals would leave the B.A.C. free to concentrate on its work for the economic benefit of the industrial chemist, while assuring and being a sign of its friendly relationship with the Institute.

Yours sincerely,
T. P. DEE.

October 10, 1937.

DEAR MR. PILCHER,—In order to strengthen the suggestions I have already made to the Council, I wish to add the following:—

3. That it should be endeavoured to arrange that in future the Institute should nominate one member of the B.A.C. Nominations Committee, while the B.A.C. should nominate a certain number of chemists (members of both bodies) to the Council of the Institute.

Yours sincerely,
T. P. DEE.

Oil Production Costs

SIR,—As another reader of many years' standing, I feel disposed to take up the cudgels on your behalf against Mr. N. H. Freeman. In his letter published in your issue on October 9, Mr. Freeman has drawn a red herring across the trail, the scent of which it is desirable to expunge. In brief, Mr. Freeman's objection to your editorial comments upon the oil question amount to a contention that (1) it is unnecessary to manufacture oil from coal by any synthetic method because suitable oil can be manufactured from coal by other methods; and (2) you have under-estimated the ability of the chemical engineer to assess the value of the chemical process.

I should like to ask Mr. Freeman not to hide the wonderful process of which he writes, but to let us have particulars, so that the whole nation can rejoice in the possession of a process that can "manufacture refined oils and spirit direct from coal at a cost below 2d. per imperial gallon." What can this process be? Can it be low temperature carbonisation? There is only one low temperature carbonisation process, so far as I am aware, that is providing the high-class aviation spirit to which Mr. Freeman refers. Can it be that that company is supplying the wants of our air force at 2d. or 3d. a gallon? Alas no! that is but a dream. No one would be more delighted than the tax-payer if it were true, but the fact remains that all commercial carbonisation undertakings are very grateful for the taxation on imported petrol which helps their admittedly hard struggle to pay dividends. I challenge Mr. Freeman to state where this process of which he speaks is operating on a commercial scale. Surely he has not ventured to put forward as a serious argument against your editorial comments, calculations based on a process which exists only in the laboratory or on paper?

Even if Mr. Freeman can answer this question, will he then tell us how he proposes to produce by the process he names, the oils that we should require for use in war-time, due account being taken of the disposal of the by-products, if there are any. As a basis Mr. Freeman might like to note that our present consumption of all oils is roughly 10,000,000 tons a year, and that during the last war it was found that an army required per million men, 50,000,000 tons of oil a year, since when the air force has become more important and the army has been mechanised—to say nothing of the naval requirements.

Finally, to refer briefly to Mr. Freeman's second point, I cannot think that you, sir, would under-estimate the power of the chemical engineer to calculate capital and other charges "if the process is known to him" (Mr. Freeman's words). There lies the snag. Information concerning the Fischer-Tropsch process is not easy to come by, and it is evident to me as a chemical engineer, that the Australian Committee has calculated from what they think the process is, not from first-hand information. It happens that I have had an opportunity of going into the Fischer process rather more fully than most people in this country; and as the result of that experience, I, like you, sir, would be very interested to know from what source the Australian Committee obtained its figures for the capital cost of this installation. I can assure you that they bear no relation to what I believe to be the actual cost in this country.—Yours faithfully,

CONSULTING ENGINEER.

Lubricating Oil Plant to Apply New Process

THE recently completed plant of the Vacuum Oil Co. at Notre Dame de Gravenchon makes use of the Clirosol process for refining. The object of the process is to separate the elements in the oil which are useful for lubrication from those which are useless or even harmful. The oil is first filtered to remove excess impurities and then subjected to treatment by two solvents. After thorough mixing, to bring the solvents into intimate contact with every particle of oil, the mixture is allowed to settle in tanks. Separation can then be made by simple siphoning. This gives a solution containing the useful elements and another containing the tars and lighter hydrocarbons. Each of these is treated to remove the solvent which is re-used. The residue considered as unfit for lubricating oil is used as fuel in the plant. The oil obtained is said to be much freer from non-lubricating elements than that obtained by other methods.

Death of Mr. W. B. Ferguson, K.C.

Distinguished in Science and Law

Mr. W. B. Ferguson, K.C.

MR. WILLIAM BATES FERGUSON, K.C., who died on October 7, at the age of eighty-five, was the only son of the late Mr. Pearson Biggs Ferguson, J.P., of Manchester. He was educated at Manchester Grammar School, and at the age of 16 obtained an open scholarship at Merton College, Oxford. The next year he gained an open junior studentship in Natural Science at Christ Church. He took his degree in 1874 with first-class honours in Natural Science, and was afterwards engaged at Oxford in research work and lecturing. About three years later, with Professor Odling, Vernon Harcourt, W. Fisher, and others, he took part in the movement for the foundation of the Institute of Chemistry, and was one of the original Fellows. He was called to the Bar in 1882, and took silk in 1900.

In 1900 Ferguson was elected to a Fellowship of the Royal Photographic Society, in which year he brought out his paper on copper toning. He did much research work with Mr. B. E. Howard, F.R.P.S.; their first published paper on "Control of the Development Factor at Various Temperatures," was read before the Royal Photographic Society in 1905. The next year followed a paper on "A New Method of Calculating the Times of Development at Various Temperatures," which was the foundation of the system of time and temperature development now widely known and used. Kodak, Ltd., were the first to take it up, and other manufacturers followed in due course. Among his many inventions for the measurement of photographic densities, the F.R.B. photometer is now used by Ilford, Ltd., as the standard instrument. He arranged the publication of the Hurter and Driffield manuscripts in a special memorial volume of the Royal Photographic Society's journal, and afterwards raised funds for the Hurter and Driffield Memorial Lectures, the first of which he himself gave in 1918. In recognition of his work the Royal Photographic Society, conferred upon him an Honorary Fellowship in 1914 and the Progress Medal in the same year. In 1918 the coveted Hurter and Driffield Medal was awarded to him for his researches, and in 1925 in further recognition of his work he received the Davanne Medal of the Société Française de Photographie. He was also a member of the council and a vice-president of the Royal Photographic Society, and a vice-president of the British Photographic Research Association from its formation.

He is survived by his wife and two daughters.

The Oxidation of Methane

Yields of Technically Useful Products Investigated

THE oxidation of methane at pressures up to 200 atmospheres, and temperatures up to 350° C., has been studied by Boomer and Broughton (*Canad. Jour. Res.*, 1937, *15*, 375-382) with the object of obtaining the highest possible production of technically useful products, such as methanol.

From a variety of catalysts investigated, copper and silver were selected as being the only really efficient ones. Copper was introduced as a lining of the reaction vessel, and the silver catalyst was prepared by the reduction of silver nitrate absorbed on asbestos fibres, with strong formic acid. The methane was obtained as natural gas, the sulphur compounds in which were converted to sulphur dioxide by passage through 98 per cent. sulphuric acid, the SO_2 being then absorbed in caustic soda. With the copper catalyst, oxidation was rather slow at 325°, and the yield of useful products small, even at the highest pressures; at 350° it was more than twice as fast, and, at pressures of about 150 atmospheres, up to 4.0 per cent. of the total carbon content of the gas was oxidised, of which, in the most favourable cases, 37 per cent. appeared as technically useful liquid products—principally methanol, associated with small quantities of formaldehyde and formic acid. The gaseous products contained carbon monoxide as well as dioxide. At temperatures, higher than 350° oxidation of the methane was more extensive and complete, so that the yield of technically useful products was very much smaller; in all cases, the yield of methanol was higher with increasing pressures.

(*Continued at foot of next column.*)

Australian Tariff Changes

Compounds Containing Sodium Cyanide

THE Department of Overseas Trade has been informed by telegram by the Senior Trade Commissioner in Australia that an application for removal from Tariff Item 404 of compounds containing sodium cyanide for the case hardening or surface hardening of steel has been referred to the Tariff By-Law Advisory Committee. The present Customs Tariff treatment of such compounds is as follows:—British preferential tariff, free. General tariff, *ad valorem* 15 per cent. The removal of the goods from Tariff Item 404 would, it is thought, render them subject to tariff treatment as follows:—Tariff Item 422 (A) case hardening mixtures, compounds and cements: British preferential tariff, *ad val.* 20 per cent. General tariff, *ad val.* 30 per cent. The British Preferential Tariff rate is subject to an exchange adjustment. The application will be considered by the committee at a meeting to be held on November 2.

Any United Kingdom firms or associations interested should communicate immediately with the Department of Overseas Trade, 35 Old Queen Street, London, S.W.1, quoting Ref. 17682/37.

(*Continued from preceding column.*)

With the silver catalyst, the amounts of carbon oxidised, and of methanol, formaldehyde and formic acid produced, were about the same as with copper, but the optimum conditions were obtained at a lower temperature (310°), and a peculiarity was that all the formic acid appeared as methyl formate.

The Training of the Chemical Engineer

Combination of Theory and Practice in Right Proportion

ALTHOUGH chemical engineering is so essentially a practical science, like many other professions its roots are deeply embedded in the soil of scientific principles, said Mr. H. W. Cremer, F.I.C., M.I.Chem.E., in his address on "Theory and Practice" when he inaugurated the course in chemical engineering at the Sir John Cass Technical Institute, London, on October 6. Growth can be encouraged, as is the case with other fertilisers, by a careful application of theory, but any attempt at forced feeding is likely to be attended by disappointing results, here as elsewhere. To be a successful chemical engineer, it is necessary to combine these ingredients, theory and practice, intimately and in the correct proportion, and it was to certain aspects of this mixing process that Mr. Cremer ventured to draw the attention of his listeners. "Do not let us confuse mixing with agitation," he said, "although some of us are aware that the development of chemical engineering in this country, both as a separate branch of applied science and as a definite profession, has in fact involved a certain amount of the second process."

Chemical engineering, having already lived anonymously for upwards of half-a-century, decided to continue to live and, furthermore, to acquire a local habitation and a name. The result was that there came into being, some fifteen years ago, the Institution of Chemical Engineers. Nevertheless, many were the pointed and at times distinctly rude remarks directed at the infant profession. Some regarded it merely as a freak and a fit subject for jest; others as the offspring of a somewhat irregular union between an otherwise pure science, chemistry, and that worldly fellow, engineering, and therefore as something unorthodox. Interest was displayed, however, both inside and outside the family circle, when it was discovered that the marriage lines were, in fact, quite in order, and that this vigorous youth bore no bend sinister on his escutcheon after all.

Mr. H. W. Cremer.

The education of the growing child had next to be considered. Mother Chemistry, evidently not quite happy about father's influence, sought to keep the lad under her wing as long as possible. Engineering, to tell the truth, was not very interested, so long as the boy was kept out of mischief, in so far as his own profession was concerned. So our young friend, as so often happens during childhood, knowing what he wanted yet not allowed to have it, was obliged to become a chemist first, and then to add such engineering as time and opportunity allowed. He must sometimes have suffered untold hardships in the process of being made into a pure chemist against his inclinations, because his mind was more attuned to the reception of facts than to an appreciation of those recondite places in which the pure chemist is prone to wander, and where it is not always either easy or profitable for more practical minds to attempt to follow. Eventually some well-wishers of the family persuaded father to take an interest, and realising that there was so much common sense and determination in the youth, he agreed that this young son of his ought to be ranked as an engineer after all.

Thus it is that, at long last, we find an undergraduate course in chemical engineering instituted by the University of London in the Faculty of Engineering, and leading to a bachelor's degree. Many discussions took place before more or less general agreement was reached in the university on this point, and it is a great source of gratification to those persons who have contended for so long that this subject as its name implies is a definite branch of engineering, to know that it will hencefore take its place alongside civil, mechanical and electrical engineering in our great university.

With that foresight which one has become accustomed to associate with it, the Sir John Cass Institute has so framed its course of instruction in chemical engineering that this is readily adaptable for both undergraduate and postgraduate training in the subject, and one has only to glance at the names of those who serve on the consultative committee on chemical engineering to realise that the governing body appreciates in full the need for close co-operation with industry. Another excellent feature of the curriculum is the series of lectures included in it which it given by professional men of high standing, the benefit of whose experience is of such vital importance when the time comes to practice in industry the theoretical knowledge which has been acquired during the more formal course of instruction.

Having dealt briefly with the historical side, Mr. Cremer returned to the title of his address, "Theory and Practice." In the word "theory," he said, he did not intend to refer to the exposition of general principles in the lecture room and the experimental verification of these principles later in the laboratory. There is no need to do that for the necessary groundwork for the training of the chemical engineer has been clearly laid down and substantial agreement has been reached on this point. The Institution of Chemical Engineers has stated that he must possess a thorough general knowledge of mathematics, chemical reactions and physical laws, combined with a thorough grasp of the principles of mechanical and electrical engineering and those branches of civil engineering which deal with the strength of materials and the theory of design and construction. To these he would add metallurgy, a subject which has been very closely associated with the Sir John Cass Technical Institute for so many years. He ventured to suggest that all who are interested in chemical engineering education should never lose sight of the fact (which was pointed out by the American Institute of Chemical Engineers years ago) that chemical engineering, as distinguished from the aggregate number of subjects comprised in courses of that name, is not a composite of chemistry and the various branches of engineering, but is itself a definite branch of engineering, the basis of which is those unit operations which, in their proper sequence and co-ordination, constitute a chemical process as conducted on the industrial scale. It is of the highest importance to realise this, otherwise the risk is run of turning loose into the world an individual who describes himself, and who is styled by his teachers a chemical engineer, but whose only claim to the title is that he possesses snippets of this, that and the other subject, without the necessary blending of these subjects into a co-ordinated whole, and consequently without the ability to apply them adequately to the design, construction and operation of chemical plant, which is the true function of the chemical engineer.

Continuing, Mr. Cremer said: "It is in a more restricted sense that I would use the word 'theory' this evening, viz., as the purely scientific explanation of phenomena, or as a doctrine or scheme which terminates in mere speculation. I feel that a note of warning should be sounded here, for, to my way of thinking, we in our young and healthy profession should not emulate those who make it their business to formulate and advance new theories on doubtful or entirely hypothetical foundations. Admittedly, many expressions useful to the chemical engineer have been deduced by pure scientists largely or entirely as a result of theoretical reasoning. Some of these can be applied in their simplest form, others only when the gap between ideal and actual conditions has been wholly or partly bridged. In other cases, even though their practical ap-

plication is very limited, they frequently indicate the general factors which have to be taken into consideration, and so act as valuable pointers in arriving at a suitable method of process operation or plant design. But in many respects, practice is so far ahead of theory that the safest basis for design is still the experimentally determined facts obtained as a result of small or large scale trials on the material or process in question. In view of these large gaps between theory and practice, let us see to it that at all costs what may be termed academic research in the field of chemical engineering shall be directed towards problems which have an unmistakably practical bearing. There is an enormous range of useful work waiting, in fact, crying out to be done, which if properly done will be of untold benefit to the designers of process plant in general.

"There need be no anxiety lest the standard of such research work should fall short of that of corresponding investigations in the realms of pure science, for I could quote many instances in which the standard of theoretical reasoning and experimental technique required should satisfy even the most fastidious. Above all, let us not seek to explain the obscure by that which is still more obscure. Unfortunately, like other great heights, the summits of formal science are frequently shrouded in mist and are very indistinct to those below, at times they are even obliterated altogether. It is more fitting, I think, and certainly more useful, that chemical engineering research should dwell somewhat lower on the mountain side, where it can take a clear view and a long one, and a view moreover which the more unsophisticated can enjoy with it.

"It is inevitable, and in fact desirable, that even the most utilitarian research should result in the formulation of expressions the object of which is to express mathematically the effect of the various factors involved. Some of these are simple, some extremely complicated to ordinary persons like myself, but if they are honestly and painstakingly arrived at they will not only serve to carry us along the road towards a better understanding of the particular phenomena concerned, but also toward our final goal, viz., the quantitative solution of problems involving such phenomena in terms of chemical plant. There must be moderation in all things, however, and the perpetrator of a new formula should be well satisfied as to its genuineness before he decides to inflict it upon a long-suffering but already overburdened world.

"The successful practising chemical engineer uses formulæ a great deal, but bitter experience in a hard world has taught him exactly how far he can rely upon them. He has, moreover, up his sleeve various privately owned constants which he knows just when and how to apply. As a rule he does not say much about these, and small blame to him, for his bread and butter largely depend upon them. The better you get to know him, however, the more you will find that on a great many occasions he prefers to rely almost entirely on basic principles, treating his particular problem on its merits, and making no attempt to apply any hard and fast rule. I do not think it an exaggeration to say that in no branch of applied science do basic principles count for so much as in chemical engineering, such is the breadth of the field covered by it, and so great is the paucity of reliable data concerning many of its operations."

"To-day," said Mr. Cremer, "the young chemical engineer is making his mark in industry not on account of his technical skill alone, but also on account of his more than passing acquaintance with the economics and legal aspects of his profession, with its essentially human side as typified by such important matters as the safety and welfare of those whose lot it is to work under his direction, and with works administration generally.

"Among these extra-scientific qualities there is miscibility with one's fellow men and toleration of other points of view. It is well to remember that a very high proportion of those in industry, although quite oblivious of the mysteries of science, are still extremely useful members of works fraternity. We must not make the mistake of thinking that the mere mention of '*p*H,' for example, will impress such persons or that it should be sufficient to quell an argument with the uninitiated. A chemical works foreman, particularly if he comes of a line of similar stock, can tell us many useful facts which are not dreamed of in our philosophy, but the probability is that he will not tell us anything at all if we '*p*H' at him. The chemical engineer will probably find that his duties will at some time or another bring him into contact with each and every branch of science, for his profession in its widest form has need of them all. He has splendid opportunities, therefore, not only as a co-operator but also as a co-ordinator, that is, if he goes the right way about it.

"Secondly, the chemical engineer should possess, or cultivate if necessary, the ability to express himself clearly and concisely. Nothing is more irritating to boards of directors, in fact to anyone who has occasion to peruse technical reports, than turgidity of style and obscurity in the presentation of facts. Punctuation is not necessarily the thief of time; a comma in time frequently saves nine. Much excellent work has been nullified by inability on the part of the person concerned to make himself understood, and as it is one of the primary duties of chemical engineers to make reports on their work. Thirdly, the chemical engineer should never lose sight of the fact that chemical engineering processes are carried out industrially for economic reasons, the object being to make a profit. He will save himself endless trouble if he remembers this.

"Above all," concluded Mr. Cremer, "the chemical engineer must realise that no matter how scientifically and economically sound his design of a plant may be, unless it can be operated without danger to the health and safety of the operative, his duty as a chemical engineer has not been fully discharged."

Rock Phosphate in the United States

Recovery of Phosphorus by Blast Furnaces

MIDYEAR reports from the United States forecast a 20 per cent. increase in shipments of phosphate rock during the current year as compared with 1936, when they aggregated 3,351,857 tons valued at $11,406,132. For the first six months of 1937 the quantity of phosphate rock sold or used in the United States was 1,930,582 tons valued at $5,922,332. Comparable figures for the corresponding period of last year are not available, but production of superphosphate, by far the leading use for phosphate rock, advanced 48.1 per cent. and raw rock shipments for the first half-year are 15 per cent. more than one-half those for the calendar year 1936. Exports reported by producers for the six-month period of 1937 aggregated 413,030 tons valued at $1,661,742 and represented only 21 per cent. of the total tonnage shipped, compared with 35 per cent. of the total shipments during the whole of 1936.

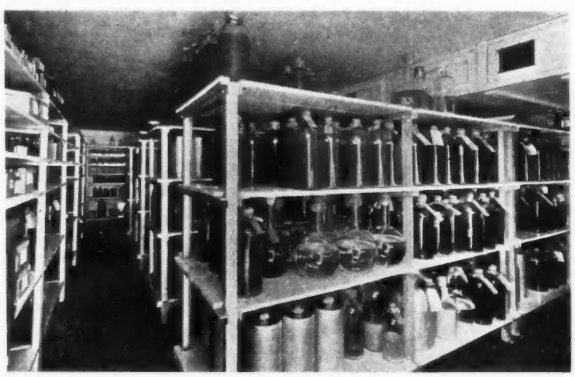
The 1936-37 fertiliser year came close to an all-time record, reflecting active educational and promotional work by Government and private agencies. Wide publicity has been given to the statement, attributed to Tennessee Valley Authority experts, that the United States alone could use ten times as much phosphate as it does now, if the needs of the land were reasonably met. A new bulletin of the Fertiliser Research Division of the U.S. Department of Agriculture outlines a blast-furnace process for recovering elemental phosphorus which can be shipped at only a fraction of the cost of transporting an equivalent quantity of phosphate rock carrying, say, 14 per cent. of the element or superphosphate with only 7 per cent. phosphorus.

The Evans' Biological Institute

Opening of New Extensions at Runcorn

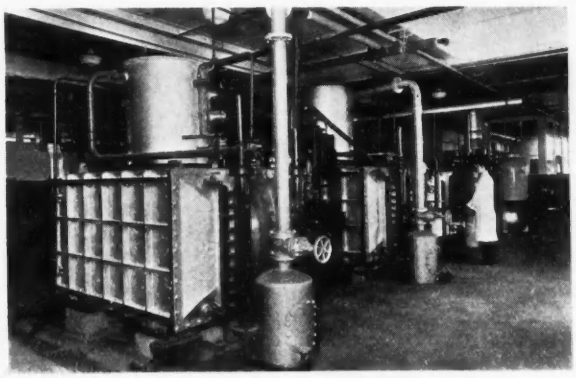
NEW extensions to the Evans Biological Institute at Runcorn were opened by Lord Derby on October 7. The organisation is the result of continuous development during the last 25 years, and originated in the early years of this century as a laboratory and farm station in connection with the Liverpool Institute of Comparative Pathology under the ægis of the Liverpool University. At that time, interest was being aroused in biological therapy and immunology and in a more or less small way, much valuable work was done on the then somewhat confined premises. The Liverpool School of Tropical Medicine also carried out similar work on the same site.

Recognising the immense importance of the work, the Liverpool firm of manufacturing chemists, Evans, Sons Lescher and Webb, Ltd., took a definite interest in the Institute and in fact the present chairman of that company, in those days, acted as honorary secretary to the institute. Shortly before the war, the University, for financial reasons, was compelled

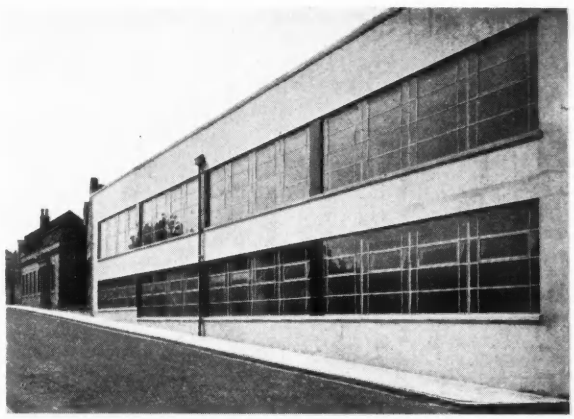


Internal view of refrigerator for storage of antitoxins.

to relinquish its activities at Runcorn, and the laboratories and farm station and laboratory personnel were taken over by Evans, Sons Lescher and Webb, Ltd., who realised that the work carried on showed much promise and should be a definite asset to medical progress. Although, to some extent, the activities were restricted during the war and for some few years afterwards, valuable work was done and much experience gained. Gradually the scope of the work carried on was extended and the accommodation increased. In 1928 a new building, containing up-to-date laboratories and equipment, was erected. Subsequently, the progress made has been remarkable; additional stables have been erected, and this year another commodious new building, now opened by Lord Derby, has been completed.



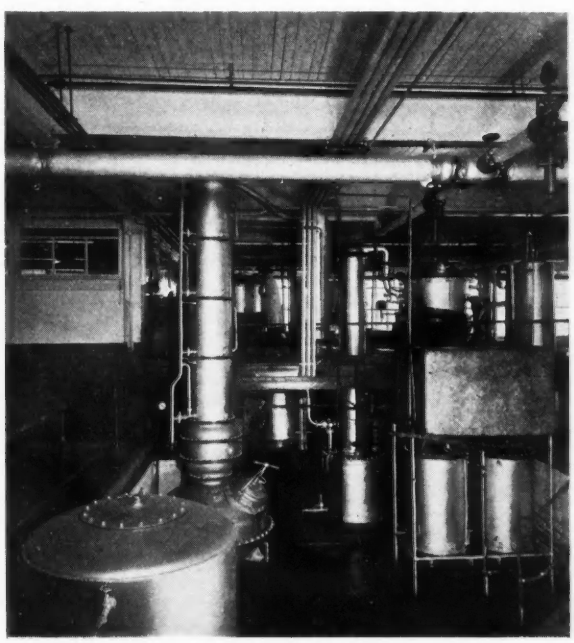
Vacuum drying ovens.



New extension to the Evans' Biological Institute at Runcorn.

During all this time, the work originated by the Liverpool Institute of Comparative Pathology has continued along similar lines. These lines are relative to the most modern aspect of medicine in that a close study is made of the vital processes of living organisms and, by seeking to understand the cause of disease, to evolve suitable measures for prevention rather than introduce new palliative measures for use in treatment. It may truly be stated that no branch of medicine has shown greater advance during the past two decades than that concerned with immunology and biological therapy, and it is research work in this connection in which the Institute is primarily engaged. Whereas comparatively a few years ago, such conditions as diphtheria and lockjaw were attended by a high mortality, it is now possible by means of toxoids and antitoxins to prevent and cure these conditions. So that in these days, the fear of diphtheria has diminished and injuries received in peace or war do not give rise to tetanus.

In recent months the scope of the research work carried on at the Institute has been extended to chemotherapy. Since the discovery in 1935 that it is possible to control streptococcal infections by means of certain azo dyestuffs, considerable progress has been made in the chemotherapy of various infective



Vacuum still platform.

conditions due to streptococci and similar organisms. The original compounds were very acid in reaction and only slightly soluble in water. Following research, great advances have been made during the last few months, and it has now been proved that *p*-aminobenzenesulphonamide is the most effective sulphonamide derivative for the purpose as it is both powerful and safe in its therapeutic action. This is made at the Institute and sold under the name of Streptocide.

It should be mentioned that the Institute is licensed under the Therapeutic Substances Regulations, and thus is intimately linked with the Ministry of Health Administration. Under these regulations, practically all the products with which the Institute is associated, must maintain a very high standard, and it is a matter of some considerable pride on the part of the research workers to know that in their work, they are assisting in maintaining for British medical products, a standard comparable, if not higher than that in any part of the world. The essential feature of Evans Biological Institute is research work with a view to providing the medical profession with means of preventing disease in their National Health Campaign and forging more effective weapons against disease. A special highly skilled staff of doctors and biological chemists is maintained to carry on this work. They realise that although the last quarter of a century has seen such great progress in medicine, there is still much unknown and, in the same spirit of uncommercial inquiry the definite scientific tradition established in the early years is being maintained.

The Production of Oil from Coal

Government Urged to Increase their Efforts

A RESOLUTION to the effect that "This conference, while congratulating the Government upon the assistance and encouragement given towards the production of oil from coal urges them, as a matter of national necessity, to increase their efforts in the direction of actual production" was moved by Captain G. L. Paton Reid (Rothwell) on the occasion of the 64th annual conference of the National Union of Conservative and Unionist Associations at Scarborough, on October 8.

Captain Reid said in spite of all that was being done, 95 per cent. of the oil and petrol used in this country every year must be imported, and only 5 per cent. of that quantity came from Empire countries. In the event of an emergency that would be an intolerable and dangerous situation. Germany was now producing by her own process 50 per cent. of her own requirements from her own coal. Given the initiative, this country possessed sufficient brains and money to do the same thing. Undoubtedly the production of oil from coal was an expensive process, but in view of the urgency of the problem the money should be set aside as a major defence item in the rearmament Budget.

Mr. A. K. Charlesworth (Wakefield), seconding, asked whether it would be feasible for the Falmouth Committee, which had now been sitting for five months, to make an interim report to the Government. Such a procedure, he considered, would do a lot to allay public anxiety. It was known what other countries were doing, but he thought they were spending large sums of money on plants which were not commercially sound before the essential foundation of the scientific research had been thoroughly established. None the less, they had made great strides, and every delay in developing and assisting the experiments in progress made this country drop farther behind in the vital race. The Government, he said, should appoint some organisation to deal with the problem, which should concentrate on research, and which, when it was thoroughly satisfied on the technical and economic possibilities of any process, should make capital grants towards the erection of plants.

Captain Crookshank, Parliamentary Secretary to the Mines Department, said he was glad the matter had been raised, for it was one of national concern. In addition to the important work that was being done by the Fuel Research Board in testing and reporting upon processes for the extraction of oil from coal, Parliament in 1934 passed an Act as a result of which home-produced light oils received the considerable rebate of 4d. a gallon for a period of nine years, or the equivalent taken in larger amounts over a shorter period.

At present light oils produced in this country got the benefit of that rebate to the extent of 8d. a gallon. That gave some idea of the financial implications of large schemes of producing oil from coal. The import price was something like 4d. a gallon. Even in recent months, as showing that the Government had not been neglectful of this subject, in conjunction with the Nuffield Trustees the Commissioner for the Special Areas, out of money provided by Parliament, had made a grant of £150,000 towards the erection of a low-temperature plant in South Wales. That showed that in suitable cases assistance was already given. In dealing with this subject the Government had always in view the two objects of increasing employment and improving national defence, but however desirable those objects might be they must have some regard to the cost and the economics of their policy.

That oil could be made from coal was technically established, continued Captain Crookshank. In 1934 we produced at home 54,000,000 gallons of light oils and last year the production was 92,000,000 gallons. But we still produced only some 7 per cent. of our requirements of light oils. The home production of heavy oils had increased from 90,000,000 gallons in 1934 to 103,000,000 gallons last year. Of the home-produced petrol about one-third was made last year by the hydrogenation process, and for that purpose 400,000 tons of coal were required. It was because of the vital importance of the oil problem in a time of emergency and because of the different and difficult commercial and technical considerations involved that the Government had set up a committee of inquiry under the chairmanship of Lord Falmouth. He hoped they would await the results of that inquiry with such patience as they could.

Memorial to Samuel Smiles, LL.D.

A BOOK called "Self Help" written by Samuel Smiles was widely read in the last century, an indication of this being shown by its having appeared in 22 languages. It developed from a lecture given in 1845 in the old Cholera Hospital, Leeds, to a mutual improvement class of working men. Samuel Smiles was born in 1812 at Haddington, and educated at the Burgh School and at the University of Edinburgh, where he qualified in medicine. By his voluminous writings and lectures he helped to create in the West Riding an alert public opinion on such questions as the repeal of the corn laws, parliamentary reform, national education, and he took a special interest in the establishment of free public libraries, the one at Zion School, founded by working men, being the first in Leeds.

A memorial tablet in bronze is to be fixed on the old school building and a set of books has been presented by Sir John Murray, K.C.V.O., D.S.O., whose firm published them. Sir Walter D. Smiles, M.P., is presenting a large framed portrait of his grandfather. Dr. Samuel Smiles, F.R.S., professor of chemistry at King's College, London, is a son of the youngest son of the author. Mr. E. Kilburn Scott, A.M.Inst.C.E., of 38 Claremont Square, London, N.1, is hon. organiser of the memorial, and Mr. A. Richardson, of Zion School, New Wortley, Leeds, is hon. treasurer.

Lubrication and Lubricants

Chemical Aspects at a General Discussion held by the Institution of Mechanical Engineers

A GENERAL discussion on lubrication and lubricants was held by the Institution of Mechanical Engineers, in London, October 13-15. Over 130 papers were presented. The proceedings were opened by the president, Sir John E. Thornycroft. In the evening a conversazione was held at the Science Museum, South Kensington, S.W.7, when guests were received by the President and Lady Thornycroft. Simultaneously an exhibition was opened at the Science Museum to illustrate the subjects under discussion. This exhibition will remain open to the public until October 31.

Metallic Soaps in Lubricants

THE prolongation of the life of lubricating oils and the diminution of deposits from such oils are problems which have claimed the attention of chemists and engineers, and still continue to do so, said Mr. E. A. Evans and Mr. A. L. Kelman in a joint paper on "Metallic Soaps in Lubricants." These problems can be divided into chemical and engineering phases. The chemist devotes his energies to the treatment of the product to render it less prone to decomposition, whilst the engineer endeavours to design an engine in which the lubricant is operating under favourable conditions.

The greatest efforts of the chemist have been in the field of refining. In this he has been handicapped in not knowing sufficient about the hydrocarbons with which he has to deal, and not knowing the mechanism of their decomposition, or chemical change. Working under these disadvantages he has been compelled to make various assumptions and adopt arbitrary tests.

Oxidation and Inhibitors

That oxidation does play a prominent part in oil deterioration cannot be denied. The oil in the crankcase of an internal combustion engine has an average temperatre of about 60° C., though in some cases it rises to 150° C., and in other cases never rises about 50° C. Is this temperature sufficiently high to promote oxidation? As the oil is atomised and exposed in thin films oxidation is induced, but surely the most likely place for real activity is on the cylinder walls, and in piston ring areas where the temperature is high. In these parts the catalytic effect of the ferrous metals is most likely to be active, yet there is a growing inclination to conduct oxidation tests at lower temperatures and almost a disinclination to conduct the oxidation test in the presence of iron.

In many industries inhibitors are used to reduce the velocity of reaction. It is not surprising, therefore, that the chemist should suggest inhibitors to give resistance to lubricating oils. Unfortunately, organic inhibitors have not so far proved to be of value in lubricants working at high temperatures, though it is possible that for temperatures up to 60° C. they can be used. β-Naphthol, phenyl-α-naphthylamine, tertiary butyl cresol, guaiacol, amongst others have been suggested.

Compounds of metals were advocated fifty years ago by Wass (1887). He added ashes of lead or zinc or tin to a preparation comprising an animal, mineral or vegetable oil, to which was added a small quantity of asphaltum and glycerin. The metallic oxides were added to minimise any tendency to gum. The Villiers London Co. protected (1922) the addition of metallic stearate to castor oil to render it less liable to carbonisation. Evans (1926) showed that electrical insulating oils could be rendered more resistant to oxidation through the agency of some metallic soaps. Amongst others he instanced tin oleate and nickel stearate. Following upon the use of tetraethyl lead in petrol to prevent too rapid oxidation it is not surprising to find Callendar, King, and Mardles (1927) using tetraethyl lead, iron carbonyl, etc., to prevent the formation of organic peroxides of oil. Then Helmore (1932) combined the ideas of Evans and Callendar and used tin oleate in conjunction with tetraethyl lead. Metallic compounds act not ony as inhibitors to oxidation, but also as running-in compounds when present in vegetable lubricating oil (King 1932). A further use of such compounds was shown to exist by the Standard Oil Development Co. (1931) in depressing the pour point of hydrocarbon oils.

Turning from the patent literature to scientific journals, Hatta (1926) has described tests in which tetraethyl lead was added to turbine oils to reduce sludge formation. Yamada (1930) differentiates between sludge forming and anti-sludge forming metallic soaps in transformer oils.

When discussing inhibitors it is postulated that deterioration of the oil and the production of solid deposits are due principally to oxidation. If oxidation does occur in an internal combustion engine it is probable that it is not a perfectly straightforward affair. It may occur in the crankcase at temperatures up to 80° C., and in exceptional cases up to 150° C. It may occur on the piston rings at 200-250° C., or on the cylinder walls at even higher temperatues. The oxidation may take place on the surface and, or alternatively, in the interior of the oil. A whole molecule may be completely oxidised at one range of temperature and conditions, or it may be successively changed. Finally, do the metal surfaces or the metallic compounds present play any part in the chemical change? Simple though all these considerations may appear, they are far from being satisfied. It is little wonder, therefore, that the various tests which are available to the chemist are so incomplete and unconvincing when endeavouring to assess the resistance of an oil to deterioration. With all its difficulties, the engine test is still the final court of appeal.

The Simple Air Blowing Test

The simple air-blowing test has many critics of its procedure, and many unconvinced supporters of its interpretation, yet the critics are not entirely opposed in principle to an oxidation test. Since the introduction of inhibitors the problem has intensified, because some of them accelerate the oxidation in the oxidation test and reduce the manifestation of chemical change in the engine. The Air Ministry test and oxygen absorption tests have produced the same anomaly. In these methods of test the air or oxygen is bubbled through the oil and the conditions are different from those in the engine, where large surfaces are exposed either through atomisation or in thin films. The expedient of exposing an ever-changing thin film to air or oxygen in a rotating tube in an oven was tried, but the results were equally unproductive. In some cases the repeatability was poor, and in others the correlation with engine tests was bad.

Measurements of oxygen absorption can be exceedingly misleading unless the conditions under which the determination is made are carefully analysed. The use of a closed tube gives results which at first show a rapid absorption until a maximum is reached, followed by no further absorption, indicating complete saturation. If the tube is refilled with oxygen, absorption continues at approximately the same rate, and by further refillings of the tube the reaction proceeds until the oil solidifies. Needless to say the rate of oxygen absorption varies with different oils, and is modified by the addition of various compounds. Lead tetraethyl in sufficient amount will accelerate the reaction, which can be decelerated by a suitable amount of tin oleate.

Obviously the reaction between oil and oxygen in a glass container must be modified if better correlation is to be obtained. This disability is somewhat removed by heating the oil in the presence of metallic iron in a Petri dish. Whilst the increase of acidity and the increase of solid oxidation products are of practical importance, the viscosity of the oil after oxidation appears to give closer correlation with engine results. It is not suggested here that a new method of appraisal is to be found in viscosity measurement, but it cannot be ignored that viscosity modifications obtained by heating the oil in Petri dishes in the presence of iron do produce results which are in closer correlation with engine tests than do blowing and oxygen absorption methods, at least in the study of oils containing metallic soaps.

TABLE I.—INHIBITORY EFFECT OF CERTAIN ORGANO-METALLIC COMPOUNDS ON OXIDATION.

Oil.	Untreated.	Tin oleate, 0.2 per cent.	Tin oleate, 1 per cent.	Lead tetraphenyl, 0.2 per cent.	Tin tetraphenyl, 0.2 per cent.	Lead tetraethyl, 0.05 per cent.
A	0.3	—	Nil	—	—	—
B	8.9	7.4	—	8.2	7.9	—
C	1.5	—	—	—	—	0.95

The air blowing test, however, does reveal the inhibitory characters of certain organo-metallic compounds. Tin oleate, lead tetraphenyl, tin tetraphenyl, and lead tetraethyl, when added to oils A, B, C, in the proportion shown in Table I, reduce the amount of solid oxidation products, but it must not be assumed that when they are used in other oils and in other proportions a reduction will occur. The method finally adopted was to heat 6 grames of oil in a Petri dish at 180° C. For purposes of comparison in this paper the same oil was used.

Effect of Metallic Soap Addition

In each case the addition of the metallic soap led to increased oxidation of the oil as shown by viscosity, insoluble matter, and acidity. The effect of tin and chromium, although they do in fact behave as accelerators, is small, however, compared with that of iron and copper. These curves show certain features. In each case, after the addition of a certain quantity of metallic soap, larger quantities of soap have little or no effect on the oxidation. With copper, and with iron in particular, the effective quantity of soap is greater than with chromium and tin. As the period of oxidation is prolonged the effective quantity of metallic soap becomes greater. If the soap had a direct oxidation effect on the oil, then further additions of soap would lead to a proportional increase in the oxidation of the oil. As it does not, then the effect of the soap must be limited by some other factor. The oxidation of the oil is primarily autocatalytic. It is therefore possible that the products of oxidation, which themselves give rise to the catalytic nature of the reaction between oil and oxygen, co-ordinate with the metallic soap. These new products, in the cases considered here, have a greater activity than the parent body, thus giving increased oxidation of the oil in the presence of the metallic soap. On the other hand, any excess of metallic soap which has not reacted with oil oxidation products has no effect on the oxidation of the oil.

If there is a strong metallic activator present (*e.g.* iron oleate) the resultant increased oxidation will lead to the production of larger quantities of active oxidation products which will combine with the iron oleate, making larger quantities of metallic soap effective in the reaction. Similarly, under the influence of time, more oxidation products will be generated and the reaction will proceed as before.

Inhibition of Catalytic Effect of Iron

In most cases lubricating oil operates in close contact with metal surfaces. As iron and copper predominate, nearly all lubricants are exposed to an active catalyst in addition to an oxidising atmosphere. The problem is to produce an oil by refining which will resist atmopheric oxidation. That problem is being actively pursued, knowing full well that over-refining is detrimental. Experiments with metal soaps have revealed that some of them can inhibit the catalytic action of iron. Iron has been selected because it is used so extensively in engineering. The effect of iron on the oxidation of the oil is progressive, but not proportional to the amount present. When tin oleate is added to the oil the effect of the iron is proportional to the area exposed. Part of the increase in oxidation due to the iron has been inhibited by the tin oleate. Another aspect of the effect of metallic soaps in inhibiting the accelerating action of iron on the oxidation of the oil is obtained by oxidising samples of oil containing different proportions of metallic soap in the presence of a fixed quantity of iron. Thus, with tin oleate, the maximum inhibitory effect is observed when the oil contains 0.25 per cent. of metallic soap. When the surface of the iron is decreased by using metal squares instead of filings, the optimum quantity of tin oleate is found to be independent of the area of metal. On the other hand, the inhibitory effect of the soap is magnified in the presence of increased quantities of iron. Chromium shows a similar type of inhibition, but less actively than tin oleate. Thallium oleate is very interesting, but it is very costly. Approximately 0.2 per cent. of metallic soap produces the inhibitory action, consequently when a general survey of metallic soaps was being made 0.2 per cent. of soap was used in the presence of iron filings.

Barium presents some attractive characteristics, but its use is debarred by other considerations. In general, the only inhibitory metallic oleates contain tin, chromium, nickel, thallium, or titanium. The inhibitory powers of the metallic soaps are not materially affected by a change of acid radical.

As laboratory tests without proper regard to engine performance would be of little value, a series of engine tests was made under well-controlled standardised conditions, *i.e.*, a single-cylinder petrol engine was run under load at a temperature at which the maximum amount of deposit could be produced in the combustion space. Laboratory tests indicated that 0.25 per cent. of tin oleate gave the greatest inhibitory effect, and the engine showed it to be 0.1 per cent. For chromium oleate the respective results are 0.17 and 0.8 per cent. Most encouraging results were obtained in the engine when exploring mixtures of tin and chromium. Efforts to obtain similar criteria by laboratory methods were not so successful. From the engine results it is quite clear that the correct amount of tin oleate to use is 0.1 per cent. and the amount of chromium oleate between 0.4 and 0.8 per cent.

Effect of Added Substances on the Lubricating Properties

A CONTRIBUTION by Dr. H. W. Brownsdon was confined to the consideration of the effect of additions to a mineral oil in so far as they influence the wear of "70-30" brass when in frictional contact with a revolving hardened steel wheel. In an attempt to assess the relative value of such additions many comparative experiments have been carried out on a machine designed by the author.

In this machine a small hardened steel wheel 1 in. in diameter, 0.1 in. thick, and with a periphery of 0.05 in. radius, is rotated at a speed of 500 r.p.m., and is brought into fractional contact with a flat sample of the metal to be test for wear under a predetermined load, the lubricant being dropped on to the revolving periphery of the wheel. An oval wear impression is made on the metal sample, the length of which can be accurately measured and taken as a criterion of the amount of wear that has taken place during a specified time, a suitable time for running being 15 minutes. When using a straight mineral oil having a Redwood viscosity of 40 seconds at 200° F. and the periphery of the hardened steel wheel polished with No. 00 emery paper, a wear impression of about 4 mm. in length is given when the sample is 70-30 brass, the load 20 lb., and the time of running 15 minutes. The reduc-

tion in wear produced by additions made to such an oil is revealed by a reduction in the length of the wear impression.

The main interest of the experiments now reported centres around the chemical and physical characteristics of those substances which have a marked effect on wear reduction, even when added in small quantities of 1 per cent. or less. Many of these substances are acidic in character, or give rise to acid decomposition products under the temperature and pressure conditions present at the seat of friction. In many cases such decomposition is facilitated by the addition of small quantities of water. The most active acids are those of a volatile nature or readily decomposable, and therefore capable of setting up vapour or gas pressure between the rubbing surfaces. Acids of low molecular weight are generally more active than those of high molecular weight. Stable fixed acids such as perchloric and phosphoric acids do not behave as wear-reducing additions. Sulphuric acid is anomalous in so far as it reduces wear when added in concentrated form, but not when diluted, which might be explained by the fact that reaction between strong sulphuric acid and the metals may take place with formation of sulphurous acid, which is an active wear-reducing addition. Pyrogallic acid is just as active when made alkaline as when added in the acid condition. Such considerations lead to the view that other properties besides mere acidity must be looked for to explain the activity of these acidic additions.

Behaviour of Ammonia

The reducing nature of a number of the more active substances calls attention to the part that such characteristics might play in wear reduction. The very serious and accelerated wear that can result from active oxidation is shown by the results given by hydrogen peroxide additions, and it might be argued therefore that substances having reducing properties would act as protective agents against oxidation, and so lead to a reduction in wear. The behaviour of ammonia as an active addition agent for the reduction of wear is of interest in this connection, since ammonia protects steel from oxidation, even in the presence of strong oxidising agents, and it reacts with copper to form cuprous salts, powerful reducing agents. In addition ammonia is very volatile and may set up gas pressure at the seat of friction.

The behaviour of gases is of interest as tending to indicate that the presence of a small amount of practically insoluble gas in the oil has a marked effect on wear reduction. With a gas such as carbon dioxide it is difficult to conceive that its action is due to any other than a purely physical cause. The case of hydrogen sulphide is somewhat complicated by sulphide film formation, but the fact that 0.005 per cent. of such a gas brings about wear reduction equal to that obtained by 100 times more sulphur or sulphur compound might reasonably be attributed to conditions associated with the presence of a gaseous constituent. That there is no chemical combination with the oil is shown by the fact that the gases are easily removed by blowing air through the oil, after which the oil gives normal wear impressions of about 4 mm.

Protection by Film Formation

Some evidence of the effect of films, both metallic and non-metallic, is provided by some of the substances used in the experiments. Wear reduction brought about by the addition of stannous chloride and arsenious chloride is of interest when compared with the negative effect given by aluminium and zinc chlorides. All these salts hydrolyse, giving free hydrochloric acid, but the results indicate that the effect of tin and arsenic chlorides is probably due to metallic film formation rather than to acidity produced by hydrolysis. On the other hand, their action may be aso associated with their reducing nature. The active effect of silver nitrate, which is neither decomposed by hydrolysis nor has reducing properties, goes to confirm the metallic film explanation of their action. The behaviour of sulphide and sulphur compounds is generally attributed to sulphide film formation, and although this may be so, the active effect of sulphur dioxide cannot be ignored, and it may be that this is formed in sufficient quantities to have some effect on wear reduction. The effect of chlorinated hydrocarbons has been attributed to chloride film formation, but it may be that their behaviour as wear inhibitors is also associated with the reducing properties of such films and the protection they afford against oxidation of the metal surfaces.

That a neutral inert substance such as water has some effect on reducing wear can only be explained by its acting in a physical manner, probably that of exerting vapour pressure at the seat of friction. Other inert substances, such as alcohol, behave in a similar manner.

The behaviour of some of the substances may reasonably be attributed to purely physical characteristics such as vapour or gas pressure produced between the rubbing surfaces. Metallic or non-metallic films may lead to wear reduction. In some cases the desirable chemical and physical characteristics may be associated, as in formic acid, which is voltalie, decomposable into gaseous constituents, of low solubility, and also a reducing agent. A point of interest is associated with decomposable substances such as chlorinated hydrocarbons, since, as might be anticipated, the greater the load the greater is the amount of decomposition product formed, as shown by the amounts of water-soluble chloride found in aqueous extracts before and after tests made under different loads.

Laboratory Tests for Ageing of Lubricants

ENGINE troubles are caused largely because the oils fail to arrive at the parts requiring lubrication. Lubricants undergo oxidation and polymerisation in the engine, resulting in the formation of insoluble deposits which settle in the lubrication system at points where circulation is slowed down by bends and so on, and, by hindering the passage of the oil, lead to engine trouble, stated MM. Moutte, Dixmier, and Lion in a paper which reported a laboratory test for the study of the ageing of lubricants.

As a result of the tests described it has been concluded that no method of artificial ageing is yet available which gives products identical with those obtained in an engine. However, despite this, the method of artificial ageing described makes it possible to distinguish oils which have a strong tendency to form deposits. Even though artificial ageing is imperfect, it provides a necessary protection against oils of poor quality. It may be hoped that in the future a more complete ageing will make it possible to differentiate between oils which show little or no difference when aged artificially by the present methods.

To obtain a laboratory process of ageing which gives results similar to use in the engine, two methods can be suggested: (1) Heating the oil to 300-400° C. after it has been sensitised by heating at a low temperature. (2) Alternate heating at low temperature (100-140° C.) and at high temperature (300-400° C.), low temperature heating being prolonged.

The problem is rather to stimulate the ageing process than to accelerate it, for the average length of service of a molecule of oil in an engine in service is roughly 10 hours. Further, the fact that engines put into service very soon contain all the ageing products shows that the time factor relates to the quantity and not to the quality of the products. Various factors which play a part in the engine will have to be neglected in seeking a method of ageing and it will have to be sufficient to utilise the oxygen content, the temperature, and catalysts in various combinations. Other factors, particularly the action of the fuel, will have to be neglected in an approximate synthesis of the ageing process.

A criterion on which is based the suggestion that a method of ageing is availabe which produces changes in the oil similar to those in the engine, should not depend simply upon the separation of products which are soluble or insoluble in chloroform. That separation is insufficient and should be completed, either by chemical identification or by analyses of the age products obtained in the two cases.

Sulphuric Acid Data

Standard Density-Composition Tables

WHEN the "British Standard Specification for Density Hydrometers" (No. 718-1936) was published the British Standard Institution announced that density-composition tables for various solutions of industrial importance were in course of preparation.

The first of these new "British Standard Density-Composition Tables for Aqueous Solutions of Sulphuric Acid for use in conjunction with British Standard density hydrometers" (No. 753-1937) which are based on the International Critical Tables and are very comprehensive, give percentage compositions (grams of H_2SO_4 in 100 grams of solution) and concentrations (grams of H_2SO_4 in 1 litre of solution) for densities progressing in steps of 0.001 g/ml from 1.000 g/ml to 1.846 g/ml at temperatures progressing by steps to 2° C. from 10° C. to 40° C. The tables are preceded by explanatory notes. Appendices give details of the British Standard density hydrometers available for use in aqueous solutions of sulphuric acid, notes on the reading of British Standard density hydrometers in these solutions, examples of the use of the tables in conjunction with British Standard density hydrometers and details of corrections to hydrometers.

With regard to the hydrometer corrections, these are only necessary when the highest accuracy attainable with the hydrometer is desired. They may often be entirely ignored without prejudice to the degree of accuracy required. For example, over the temperature range 10° to 30° C. and for all strengths of acid, the error introduced by neglecting all corrections will not exceed ± 0.001 g/ml when a British Standard density hydrometer subdivided in 0.0005 g/ml intervals is used. When this degree of accuracy is adequate, the hydrometer reading may be taken as giving directly the density of the acid in g/ml at the prevailing temperature of the solution and the tables give directly the strength of the acid from the ascertained density. No temperature adjustment is necessary and no calculation is required. The use of British Standard density hydrometers in conjunction with the tables provides a concrete example of the simplicity of hydrometry based on density measurements.

Copies of these new tables may be obtained from the British Standards Institution, Publications Department, 28 Victoria Street, London, S.W.1, price 2s. 2d. post free.

Empire Essential Oils

Investigations at the Imperial Institute

THE current issue of the quarterly bulletin of the Imperial Institute (July-September, 1937) contains a report on two series of nutmegs sent over from Canada, which are of interest in view of the attempts which are being made to improve the quality of the product from that colony and to bring it closer to the high standard of the "Penang" nutmegs shipped from the Dutch East Indies. The nature of the volatile oils contained in the samples was investigated. In the case of one lot of nutmegs the oil contained a much larger amount of terpenes than Penang nutmeg oil and consequently was of inferior odour, but that from the second lot more closely approached in character the commercial nutmeg oil.

A considerable amount of attention is being devoted by the Department of Agriculture in the Seychelles to the development of the local essential oil industry, and the Imperial Institute is assisting in this work by examining and reporting on samples of the various kinds of oils produced experimentally and in other ways. The results of the chemical examination of samples of cinnamon bark oil, of oils of different kinds of *Ocimum*, of palmarosa oil and peppermint oil and the opinions of trade experts on their commercial value are recorded.

The cinnamon bark oil proved to be much superior in quality to any from the Seychelles previously examined at the Imperial Institute, but it will be necessary for consignments of the oil to be received and worked by the trade before its actual value can be determined in comparison with that from other sources. Of the *Ocimum* oils, a sample distilled from *O. basilicum*, the source of sweet basil oil, did not have the fragrance of the French oil, and although it might be possible to dispose of the Seychelles oil in small lots from time to time, it would not seem desirable to encourage its production on a large scale. Another oil, obtained from *Ocimum sanctum*, was of a type which would enable it to compete with spike lavender oil and it would probably find a market for use in soap perfumery, if available in commercial amounts.

A sample of palmarosa oil, distilled from a specially selected strain, proved to be of satisfactory aroma and contained an excellent percentage of total alcohols, whilst another sample, obtained from plants raised from Indian seed, was considered by a firm of essential oil distillers to be certainly superior to Indian distilled palmarosa oil. The sample of peppermint oil examined had been distilled from *Mentha arvensis*, the source of Japanese peppermint oil. It contained a satisfactorily high percentage of menthol and should find a market in competition with the undementholised Japanese oil.

Turtle oil has recently come into prominence as a constituent of cosmetics, and the results of the chemical examination of four samples of crude oil prepared experimentally in Ceyon from different kinds of turtle, should prove of interest to those in the trade. No standard figures appear to be available for the constants of the limited quantities of turtle oil at present being imported into the United Kingdom, but, so far as can be judged from the results of their examination, the Ceylon oils showed no indication of abnormality.

Amongst other matters dealt with in the present issue of the Bulletin is the use of ethylene gas for improving the quaity of tobacco leaf; the use of silica dust as an insecticide; the position of the copper industry in Northern Rhodesia; the ilmenite resources of Nyasaland, and an account of the South African ochre industry.

Chemical Weed Killers

Toxicities Compared over a Long Period

THE toxic effect of fifteen varieties of chemical weed killer on couch grass and canada thistle has been studied by Cook, Pavlychenko, Manson, and Garron (*Canad. Jour. Res.*, 1937, *15*, 422-449). The observation of the action of the various compounds was extended to a period of one year after application, which is considered essential for correct evaluation, as it was found that many substances, although producing a very rapid immediate effect in killing weeds, nevertheless do not appear to affect the roots of the plants, so that a new growth may occur fairly soon after application.

Of the fifteen substances examined, only five were found to have any useful toxicity. These were sodium and barium chlorates, arsenic pentoxide, ammonium thiocyanate, and sodium arsenite. A characteristic of all these compounds was a rather slow killing action, which, however, extended to the roots as was shown by the poorness of the next year's crop—non-existent in the case of the chlorates, the effect of the other compounds falling off in the order named. The quantities of each substance required to produce the optimum effect were found to be 600 lb. per acre for sodium chlorate, 900 lb. per acre for barium chlorate and arsenic pentoxide, and more than 1,200 lb. per acre for ammonium thiocyanate and sodium arsenite. Among the rejected compounds were several, such as sodium cyanide and dichromate, and phenol, which produced much more rapid killing of weeds than any of the five selected compounds, but which were shown to be valueless, by the appearance of a new growth, in as little as three weeks' after treatment. These substances are detoxified by the soil, so that they cannot attack the roots.

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Personal Notes

DR. W. G. MACMILLAN, B.Sc., Ph.D., has been appointed chief chemist to the Indian Jute Mills Association, Calcutta, where he will be in charge of the scientific development of jute fibre.

MR. OGDEN LIVINGSTON MILLS, a director of the Seaboard Oil Co., has died in the United States at the age of 53. He was Secretary of the Treasury to the United States Government, 1932-33, having succeeded the late Mr. Andrew Mellon, one of the founders of Mellon Institute, Pittsburgh.

MR. D. P. C. NEAVE, who has been general manager and secretary of the Copper Development Association since its inception in 1933, is resigning at the end of the present year. Mr. G. W. Preston, the association's electrical engineer, has been appointed to become general manager, and Dr. S. Baker, now assistant secretary, will become secretary.

LORD NUFFIELD has given £1,000,000 to Oxford University to provide a college expressly designed to link research in social studies with the practical demands of modern life, both in industry and government. In addition he has given a site for the college of the value of £100,000. The new college is to include a laboratory of physical chemistry, on the erection, and equipment of which not more than £100,000 is to be spent.

SIR HAROLD CARPENTER, professor of metallurgy in the Royal School of Mines, has been awarded the Carl Lueg memorial medal of the Association of German Iron Metallurgists, in recognition of his services to metallurgical science. The award was announced on the occasion of the 127th annual conference of the Association at Düsseldorf, on October 11. MR. JAMES HENDERSON, honorary treasurer of the Iron and Steel Institute, received the honorary membership of the Association for his assistance in restoring friendly relations between the British institute and the German association. HERR AXEL FORNANDER, the well-known Swedish metallurgist, also received honorary membership.

MR. RICHARD SILLER, while retaining his seat on the board of directors, has resigned the managing directorship of Lysol, Ltd., and its associated companies. Mr. Siller has been with this group of companies for over forty years, of which sixteen have been spent in England. MR. J. W. BRAY, JR., has joined the board, and succeeds Mr. Richard Siller as managing director.

OBITUARY

MR. JAMES STEPHEN, for over 50 years connected with William Murray and Son, Aberdeen central hide, skin, tallow and offal market, died at Aberdeen on October 9, aged 93.

MR. THOMAS HEWITT, who worked for 45 years at the Muspratt works of the United Alkali Co., and subsequently for Imperial Chemical Industries, Ltd., in the capacity of costs clerk, died in hospital at Lancaster on October 2, in his 70th year. He was taken ill just over a year ago and has been under treatment at Lancaster.

DR. WOLFGANG HIMMELBAUR, of Vienna, general secretary of the International Association for the Promotion and Utilisation of Medicinal, Aromatic and Allied Plants, died on September 29, aged 51. Dr. Himmelbaur was director of the State Research Station for Agricultural Chemistry, Austria, and had been decorated with the cross of the French Legion of Honour.

SIR JOHN DEWRANCE, head of Dewrance and Co., valve makers, and for 38 years chairman of Babcock and Wilcox, Ltd., died at his home at Thetford, Norfolk, on October 7, at the age of 79. From 1926 to 1928 he was president of the Institute of Metals. He had been for long on the general board of the National Physical Laboratory, and had served as chairman of the British Cast Iron Research Association. He was also a member of the Engineering Research Board and of the Commerce Degree Committee of the University of London.

Chemical Notes from Foreign Sources

Dutch West Indies

ACCORDING TO AN AMSTERDAM REPORT a plant for extracting bromine from sea-water is to be erected at Aruba, near Balashi.

Holland

SYNTHETIC RESIN PRODUCTION, chiefly of the glyceryl phthalate class, has been started by N. V. Sikkens' Lakfabrieken, at Groningen.

France

THE SOCIETE DES PRODUITS AMINO-PLASTIQUES (51, boulevard Suchet, Paris), with a capital of 25,000 francs, is to engage in the manufacture of synthetic resins.

Germany

A CORK SUBSTITUTE EXHIBITED AT THE RECENT FRANKFORT ACHEMA is based upon cuprene, a voluminous mass obtained by passing acetylene over copper at high temperatures.

A FACTORY FOR THE PRODUCTION OF CATALYSTS for the Fischer-Tropsch hydrogenation process is to be erected at Mücheln, by the Kator-Fabrik Lützkendorf G.m.b.H., which has been formed with a capital of 1½ million marks.

THE DEUTSCHE BERGIN CO. FOR WOOD HYDROLYSIS states in its annual report that while the wood-saccharification plant itself is capable of operation without a hitch, actual production has been limited by the difficulty in recovering the hydrochloric acid in a sufficiently concentrated form. It is hoped to overcome this defect during the second half of the year. The inability to run the plant to anything like its full capacity has resulted in a further loss on the year's trading, the actual trading turnover only amounting to 54,000 marks.

Mexico

WITH A VIEW TO STIMULATING the production of synthetic resins the import duty on phthalic anhydride has been reduced from $ 0.40 per kilo to $ 0.15 per kilo.

Italy

A FACTORY FOR THE PRODUCTION OF FINE CHEMICALS has been started up in Osaka-Higashiyodogawa by the Gindai Chemical Industry Works.

A CADMIUM-PRODUCING PLANT, with an annual capacity of 100 tons, is to be installed in the new Montecatini zinc smelting works at Porto Marghera.

Finland

A LARGE CEMENT FACTORY with an annual capacity of 500,000 barrels is under construction at Vilmanstrand by Pargas Kalkbergs A.B.

WITH A CAPITAL OF 20,000 MARKS the Laboratorium für Holzchemie has been established in Munich (Landwehrstrasse 1/V) to carry out analytical work in the field of wood saccharification.

A NEW RUBBER-REGENERATING PLANT will be started up at the beginning of 1938 in Hamburg by the Deutsche Gummiregenerierungswerk W. Golumbek, who will operate a process that does not destroy the fabric constituents of old rubber.

SYNTHETIC FATS MADE FROM COAL form the basis of new toilet soaps exhibited at this year's Berlin Soap Exhibition. The new soaps, already produced on a large scale at Witten (Ruhr), are somewhat more expensive than ordinary soaps, but it is shortly hoped to effect a substantial reduction.

From Week to Week

CONDITIONS OF ABSOLUTE DROUGHT have caused bleachworks in North Wales to close as supply streams have dried up.

THE STRIKE OF TEXTILE WORKERS at the Coventry works of Courtaulds, Ltd., in which over 6,000 persons were involved for more than a week, has now been settled.

THE YORKSHIRE COPPER WORKS, LTD., of Leeds, have decided to extend their manufacturing capacity, and will make non-ferrous metal tubes at Barrhead, near Glasgow.

THE OFFICIAL PRICE OF PLATINUM was reduced by 15s. on October 11, to £9 10s. per ounce. The current price compares with a peak for 1936 of £14, and with a low level for that year of £7 per ounce.

THE NORWEGIAN GOVERNMENT HAS RATIFIED the whaling agreement, signed on June 8 in London, by representatives of the British, Norwegian, United States, and other governments interested in the whaling industry.

IN THE MATTER OF Illingworth Carbonisation Co., Ltd., under powers contained in a first mortgage convertible debenture, dated May 30, 1935, Mr. Wm. R. Carter, chartered accountant of Royal Mail House, 76 Cross Street, Manchester, has been appointed receiver.

FISON, PACKARD AND PRENTICE, LTD., will hold an extraordinary meeting at Ipswich on October 29, to consider a resolution for an alteration in their articles of association. The proposed alteration relates to the quorum of members necessary for the transaction of business at a general meeting.

PAINT AND COLOUR MANUFACTURERS are faced by a considerable advance in the price of China wood oil, and there is talk in the trade of a complete drying up of supplies owing to the Sino-Japanese war. On the other hand, the decline in the price of lead has enabled producers to quote lower prices for white lead and lead oxides.

CONSEQUENT UPON A FURTHER INCREASE in pig-iron output, a new record of 1,163,000 tons of steel ingots and castings was produced in Great Britain during September, according to the statistics of the British Iron and Steel Federation. This compares with 987,700 tons in August and 1,027,000 tons in September, 1936.

A REPRESENTATION HAS BEEN MADE to the Board of Trade under Section 10(5) of the Finance Act, 1926, regarding dinitro-o-cresol. Any communication should be addressed to the Principal Assistant Secretary, Industries and Manufactures Department, Board of Trade, Great George Street, London, S.W.1, within one month from October 11.

IN AN ACTION BY BRITISH CELANESE, LTD., against Cellulose Acetate Silk Co., before Mr. Justice Bennett, in the Chancery Division, on Wednesday, Mr. E. J. C. Neep, for British Celanese, consented to the action being dismissed. Mr. J. P. Graham, for the defendants, agreed, and his Lordship said that by consent the action would be dismissed, with costs.

SHELL-MEX AND B.P., LTD., who are distributors for the Shell and Anglo-Iranian oil groups, have completed the erection of a new plant for the refining of lubricating oil at Shellhaven, Essex. The process to be employed is claimed to free the oil from every trace of impurity. The new oils will be placed on the market under grade names, such as Golden Shell (extra heavy), and Triple Shell (heavy).

DAVID MOSELEY AND SONS, LTD., exhibited a special bucket made from a mixture of rubber and Neoprene, at the Shoe and Leather Fair, recently held in London. The virtues of this bucket are that it is almost unbreakable and will resist not only acid, but also oil and petrol. Ebonite buckets of a similar type, although they resist acids are not so impervious to oils as the new type. The cost of this new bucket compares favourably with those made of ebonite.

THE NUMBER OF COMPANIES ON THE REGISTERS in Great Britain on December 31, 1936, was 159,498 (England 148,991, Scotland 10,507), states the Board of Trade annual report on companies published by H.M. Stationery Office. The total number of new companies was 13,743 in England and 638 in Scotland, while the number of companies dissolved or struck off the register during the year was 7,038, leaving a net increase of 7,343. The number of cases in which the winding-up proceedings were begun during the year was 3,190.

THE AMALGAMATION OF UNILEVER, LTD., WITH LEVER BROTHERS was approved by an overwhelming majority of preferred and ordinary stockholders of Unilever, Ltd., at meetings held on October 11. At the meeting of the preferred stockholders, 14,063 members present and voting either in person or by proxy in respect of £3,601,196 stock, were in favour of the proposal, and 30 members holding £5,630 stock were against it. At the ordinary meeting, 8,465 members holding £8,349,698 stock voted in favour and 22 members holding £3,133 stock voted against.

THE GEIGY COLOUR CO., LTD., have issued a new pattern card (No. D87), illustrating their Tinon- and Tinon-chlorine colour pastes on viscose rayon.

THE TELEPHONE NUMBER of The British Cast Iron Research Association, of 21-23 St. Paul's Square, Birmingham, 3, has been changed to Colmore 4274 and 4275 as from October 11.

THE VICTORIA FOUNDRY in McGowan Street, Paisely, which closed down two and a half years ago, has now been purchased by Stirling's Bitumen Products, Ltd., and will now be known as the Victoria Chemical Works. The company will specialise in the manufacture of bituminous and allied materials.

THE ROYAL COMMISSION on the Geographical Distribution of the Industrial Population of Great Britain, under the chairmanship of Sir Montague Barlow, will meet at the Institution of Civil Engineers, Great George Street, S.W., on Tuesday and Wednesday next for the hearing of evidence by the Board of Trade.

UNITED KINGDOM EXPORTS, INCLUDING RE-EXPORTS, totalled £49,469,000 for September, according to figures as issued by the Board of Trade. This compares with £49,233,000 in August and £40,876,000 a year ago. Imports for the month totalled £87,809,000, as against £86,659,000 in August and £71,896,000 in September, 1936.

THE INTERRUPTION OF ELECTRICAL SERVICES through failure of insulation in untested machines and circuits may cost thousands of pounds through dislocated manufacture, idle hands and damage to goodwill, states a new brochure of Evershed and Vignoles, Ltd., in which the Wee-Megger tester and Megger circuit tester are described.

A PROPOSAL TO LAY A PIPELINE along the canal towpath between London and Birmingham, with the object of lowering the cost of oil transportation, is described in the "Petroleum Times." It is pointed out that whereas oil distribution by pipeline has long been common practice in the United States, in England the obstacle has been the prohibitive cost and difficulty of obtaining suitable wayleaves.

THOUSANDS OF TONS OF SLATE REFUSE, which has accumulated in the course of centuries by the making of slates at Ballachulish, may ultimately be utilised, if experiments now being carried out by Charles Tennant and Co., Ltd., of Glasgow, are successful. A provisional agreement has already been reached between the Ballachulish Slate Quarries and Charles Tennant and Co.; if confirmed, new machinery may be installed at Ballachulish.

A SPECIAL EXHIBITION, in connection with a general discussion on lubrication and lubricants organised by the Institution of Mechanical Engineers, has been arranged in the Special Exhibition Gallery of the Science Museum, South Kensington, where it will remain open until October 31. The exhibits comprise examples of many kinds of oils and other lubricants, oil filters and testing apparatus, with specimens of bearings of all kinds, and machines to illustrate practical applications.

THE NEW FACTORY ON TYNESIDE OF THE PYROTENAX CO., for the manufacture of heat-resisting electric cables, was opened by Lord Ridley on Wednesday. The new factory, when in full swing, will employ about two hundred men. It was stated that every man of the labour employed at present was unemployed before the new factory started. The Pyrotenax Co. is associated with Reyrolles and Co., electrical engineers, Hebburn, and Imperial Chemical Industries, Ltd.

AN ADDRESS ON PHOTO-ELECTRIC COLORIMETERS was given by Mr. K. A. Williams, B.Sc., F.I.C., at the opening meeting of the new session of the Manchester section of the Oil and Colour Chemists Association, on October 8. Speaking of the Bolton and Williams' apparatus, which is manufactured by Technical Research Works, Ltd., Mr. Williams pointed out this instrument was especially accurate and rapid and could be used for reactions in which the developed colour is fugitive and requires to be measured within a few seconds of mixing the reagents.

LABORATORY BALANCES AND RELATED WEIGHING EQUIPMENT are described and illustrated in a new catalogue of Griffin and Tatlock, Ltd. This catalogue (No. 15B, Section II) has been compiled as the result of a careful survey of the best products of the world's specialistic makers. Not only does it embrace a wide range of every type of analytical balance (ordinary, aperiodic, projection-reading, chainomatic, etc.), but it lists a greater selection of micro-analytical balances than hitherto. This profusion of types will enable the potential user to choose models suitable for almost any application. The balances in this new catalogue are classified according to type and are arranged, so far as is practicable and convenient, in order of increasing price. Balances by the various specialist makers have not been classed together, as it has been thought that customers would be assisted to select models suited to their requirements if a ready price comparison were made possible.

Inventions in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Applications for Patents

HEAT EXCHANGERS.—Aluminium Plant and Vessel Co., Ltd. 25969.

FILTER PRESSES.—Aluminium Plant and Vessel Co., Ltd. 25970.

MANUFACTURE OF SHEET-METAL CONTAINERS.—American Can Co. (United States, Nov. 18, '36.) 26217.

MANUFACTURE OF FERROUS ALLOYS containing aluminium.—J. W. Bampfylde, and British and Dominions Feralloy, Ltd. 25947.

METHOD OF BRIGHT-PICKLING ARTICLES of copper-zinc alloys.—Bergwerksges G. von Giesche's Erben. (Germany, Sept. 30, '36.) 25984.

MAGNESIUM ALLOY.—Bergwerksges G. von Giesche's Erben. (Germany, Aug. 10.) 26278.

FLUID-COMPRESSORS, ETC.—N. P. Billing. 25994.

STEEL-MAKING PROCESSES.—H. A. Brassert. 26062.

STEEL-MAKING PROCESSES.—H. A. Brassert and Co., Ltd. 26062.

SCREENING-DEVICES FOR THERMIONIC VALVES, ETC.—A. F. Bulgin, and Bulgin and Co., Ltd. 25875.

PREVENTION OF ICE-FORMATION on the wings, etc., of aircraft.—D. C. Bulloch. 26032.

MEASURING AND RECORDING OF FLUID PRESSURE.—Callender's Cable and Construction Co., Ltd. 26000.

MANUFACTURE OF CONDENSATION PRODUCTS.—A. Carpmael (I. G. Farbenindustrie.) 25854, 25857.

MANUFACTURE OF POLYMERIC CARBOXYLIC ACIDS and their derivatives.—A. Carpmael (I. G. Farbenindustrie.) 25855, 25856.

PREPARATION FOR PROTECTION FROM INSECTS.—A. Carpmael (I. G. Farbenindustrie.) 26133.

MEANS FOR INCREASING THE OXYGEN CONTENT of the combustible mixture used in internal-combustion engines.—A. H. Cartwright. 26240.

WATERPROOFING OF FABRICS.—M. A. Chavannes. (France, May 14.) 26002.

WATERPROOFING OF FABRICS.—M. A. Chavannes, and F. F. Schwartz. (France, July 23.) 26003.

WATERPROOFING OF FABRICS.—M. A. Chavannes, and F. F. Schwartz. (France, July 1.) 26004.

PREPARATION OF POLYHYDROXY LEUCO DERIVATIVES of triphenylmethane.—Chinoin Gyógyszer és Vegyészeti Termekek Gyara, Reszvenytarsasag, Dr. Kereszty and Dr. Wolf, and Z. Foldi. (March 1.) 26412.

PREPARATION OF ETHERIFIED DERIVATIVES of pentahydroxyfuchsone.—Chinoin Gyógyszer és Vegyészeti Termekek Gyara, Reszvenytarsasag, Dr. Kereszty and Dr. Wolf and Z. Foldi. (March 9.) 26413.

VALVES FOR FLUIDS under pressure.—T. H. and J. Daniels, Ltd., and S. L. Day. 25868.

APPARATUS FOR OBTAINING FIBRES from the stalks of flax, etc.—A. E. Dodd. 26166.

MANUFACTURE OF MAGNESIUM OXIDE PRODUCTS.—H. G. C. Fairweather (Consolidated Sciences, Inc.). 26298.

AUTOMATIC FEED CONTROL MEANS FOR LUBRICATION of internal-combustion engines.—E. G. Fawcett. 26130.

MAGNETIC DETECTION OF CRACKS IN FERROUS METAL.—H. Fell, and L. Johnson. 26325.

MANUFACTURE OF MULTICOLOURED RUBBER MIXINGS.—E. Frölich. 25946.

ELECTRODEPOSITION OF NICKEL.—G. E. Gardam, and H. P. Priston. 25795.

PRODUCTION OF POLYMER-DISPERSIONS of polymerizable organic substances. W. E. F. Gates. 26419.

PROCESS AND MATERIALS for treating textiles.—W. E. F. Gates, Imperial Chemical Industries, Ltd., and A. Renfrew. 26420.

COATING OF METALLIC BODIES with insulating materials.—General Electric Co., Ltd. 26262.

HIGH-PRESSURE METAL-VAPOUR LAMPS.—General Electric Co., Ltd. 26263.

MANUFACTURE OF TRIFLUORACETYLCHLORIDE and trifluoracetyl bromide.—W. W. Groves (I. G. Farbenindustrie.) 25816.

STABILISATION OF SOLUTIONS sensitive to heat.—W. W. Groves (I. G. Farbenindustrie.) 26124.

ELECTRICAL DEPOSITION OF PROTECTIVE ALLOYS ON ALUMINIUM, ETC.—G. A. Hartland. 25786.

MEANS FOR PREVENTING POISONOUS GASES percolating buildings. P. C. Hogger. 26178.

DEGREASING WITH VOLATILE SOLVENTS.—N. R. Hood. 26267.

MANUFACTURE OF CARBON TETRACHLORIDE.—I. G. Farbenindustrie, A.-G. (Germany, Nov. 19, '36.) 25818.

MANUFACTURE OF SULPHONATION PRODUCTS.—I. G. Farbenindustrie, A.-G. (United States, Sept. 23, '36.) 25839.

PRODUCTION OF DETERGENTS containing alkali-metal silicates.—I. G. Farbenindustrie. 25919.

MANUFACTURE OF METHYLVINYL KETONE.—I. G. Farbenindustrie. (Germany, Sept. 26, '36.) 25949.

PRODUCTION OF SHRINKAGE EFFECTS IN TEXTILES.—I. G. Farbenindustrie. (Germany, Sept. 30, '36.) 26236.

MANUFACTURE OF COLLOIDS.—Kalle and Co., A.-G. (Germany, Oct. 1, '36.) 26237.

EXTRACTION OF WAX FROM PEAT.—D. F. Kelly, J. Reilly, and D. J. Ryan. (Irish Free State, April 10.) 26096.

PURIFICATION OF WAX obtained from peat.—D. F. Kelly, J. Reilly, and D. J. Ryan. (Irish Free State, April 10.) 26097.

MANUFACTURE OF CALCIUM CARBIDE.—T. D. Kelly. 26088.

THERMOSTATIC-APPARATUS.—R. L. Kent. 25932.

PRODUCTION OF RUBBER THREADS.—Kolnische Gummifadenfabrik vorm. F. Kohlstadt and Co. (Germany, Oct. 9, '36.) 26143.

CENTRIFUGAL MACHINES.—N. V. Machinefabriek Reineveld (Germany, Sept. 25, '36.) 25935.

CONTINUOUS PRODUCTION OF RUBBER THREAD.—R. F. McKay (International Latex Processes, Ltd.). 25907.

DEACIDIFICATION, ETC., OF RETTED FLAX.—Maschinenfabrik F. Haas Kommandit-Ges. (Germany, Oct. 2, '36.) 26200.

CATHODE-RAY OSCILLOGRAPHS.—Metropolitan-Vickers Electrical Co., Ltd. 25866.

MEANS FOR INCREASING THE OXYGEN CONTENT of the combustible mixture used in internal-combustion engines.—W. H. Middleton. 26240.

PREPARATION OF PURE SALTS OF ACID ESTERS of poly-basic inorganic acids.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. (Holland, Oct. 10, '36.) 25983.

REMOVAL OF ACID COMPONENTS FROM HYDROCARBON TYPE LIQUIDS.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. (United States, Sept. 28, '36.) 26273.

REMOVAL OF ACID COMPONENTS FROM HYDROCARBON TYPE LIQUIDS.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. (United States, Sept. 28, '36.) 26274.

REMOVAL OF ACID COMPONENTS FROM HYDROCARBON TYPE LIQUIDS.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. (United States, Feb. 8.) 26275.

PRODUCTION OF IRON-FREE COPPER SOLUTIONS.—New Process Kayon, Inc. (United States, Oct. 3, '36.) 26364.

GALVANIC CELLS with air-depolarisation.—Pertrix Chemische Fabrik, A.-G. (Germany, Aug. 14.) 26069.

PROCESS FOR OBTAINING SILICON.—Pharmakon Ges. für Pharmazeutik und Chemie. (Germany, Sept. 28, '36.) 25849.

CERAMIC ELECTRIC INSULATING-BODIES.—Porzellanfabrik Kahla. (Germany, Sept. 28, '36.) 26031.

PRODUCTION OF COMPACTLY-SINTERED CERAMIC BODIES.—Rosenthal-Isolatoren Ges. (Germany, Sept. 24, '36.) 26007.

MANUFACTURE OF COMPOUNDS OF THE CYCLOPENTANO-POLYHYDROPHENANTHRENE SERIES.—Schering, A.-G. (Germany, Sept. 29, '36.) 26389.

MANUFACTURE OF COMPOUNDS OF THE CYCLOPENTANO-POLYHYDROPHENANTHRENE SERIES.—Schering, A.-G. (Germany, Jan. 13.) 26390.

MANUFACTURE OF COMPOUNDS OF THE CYCLOPENTANO-POLYHYDROPHENANTHRENE SERIES.—Schering, A.-G. (Germany, Feb. 15.) 26391.

MANUFACTURE OF COMPOUNDS OF THE CYCLOPENTANO-POLYHYDROPHENANTHRENE SERIES.—Schering, A.-G. (Germany, Feb. 16.) 26392.

REMOVAL OF ACID COMPONENTS FROM HYDROCARBON TYPE LIQUIDS.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. (United States, May 7.) 26276.

MANUFACTURE OF COMPOUNDS OF THE CYCLOPENTANO-POLYHYDROPHENANTHRENE SERIES.—Schering, A.-G. (Germany, Feb. 19.) 26393.

MANUFACTURE OF COMPOUNDS OF THE CYCLOPENTANO-POLYHYDROPHENANTHRENE SERIES.—Schering, A.-G. (Germany, March 1.) 26394.

PROCESSES FOR INCREASING THE WETTING-POWER OF STRONG ALKALI LYES.—M. Schwarz, W. Schwarz, E. Zschimmer, F. Zschimmer, Zschimmer and Schwarz, and Chemische Fabrik Dölous. (Germany, Oct. 3, '36.) 26279.

MANUFACTURE OF COMPOUNDS OF THE CYCLOPENTANO-POLYHYDROPHENANTHRENE SERIES.—Schering, A.-G. (Germany, March 3.) 26395.

MANUFACTURE OF COMPOUNDS OF THE CYCLOPENTANO-POLYHYDROPHENANTHRENE SERIES.—Schering, A.-G. (Germany, May 25.) 26396.

MANUFACTURE OF COMPOUNDS OF THE CYCLOPENTANO-POLYHYDROPHENANTHRENE SERIES.—Schering, A.-G. (Germany, Aug. 3.) 26397.

MANUFACTURE OF COMPOUNDS OF THE CYCLOPENTANO-POLYHYDROPHENANTHRENE SERIES.—Schering, A.-G. (Germany, Sept. 4.) 26398.

MANUFACTURE OF ALCOHOLS OF STEROIDS DOUBLY UNSATURATED IN RING A.—Schering, A.-G. (Germany, Feb. 1.) 26399.

MANUFACTURE OF ALCOHOLS OF STEROIDS DOUBLY UNSATURATED IN RING A.—Schering, A.-G. (Germany, March 3.) 26400.

MANUFACTURE OF ALCOHOLS OF STEROIDS DOUBLY UNSATURATED IN RING A.—Schering, A.-G. (Germany, May 29.) 26401.

CATHODE-RAY OSCILLOGRAPHS.—G. J. Scoles. 25866.
TREATMENT OF COAL-TAR OIL.—Steinkohlen-Bergwerk Rheinpreussen. (Germany, Sept. 24, '36.) 25879.
MANUFACTURE OF ORGANIC COMPOUNDS.—E. B. Thomas. 25826, 25828.
LAMINATED SHEETS surfaced with synthetic resin.—W. L. Thurgood, and Warerite, Ltd. 26223.
MANUFACTURE OF POROUS BODIES from viscose.—Viscose Development Co., Ltd., and G. A. Fletcher. 26235.
MANUFACTURE OF COMPOUNDS of the etio-cholane series.—W. P. Williams. (Feb. 22.) 26035.

Specifications Open to Public Inspection

MANUFACTURE OF CYCLIC ESTERS.—E. I. du Pont de Nemours and Co. March 12, 1935. 471,914.
PURIFICATION OF MONO-METHYL p-AMINOPHENOL.—Kodak, Ltd. March 12, 1935. 471,917.
WASHING AND CLEANSING AGENTS.—W. W. Groves (I. G. Farbenindustrie.) March 13, 1936. 471,921.
PHOTOGRAPHIC DEVELOPERS AND FIXING AGENTS.—I. G. Farbenindustrie. March 13, 1935. 471,922.
MANUFACTURE OF AZO DYESTUFFS.—I. G. Farbenindustrie. March 13, 1935. 471,923.
SYNTHETIC RESINS.—Bakelite, Ltd. Oct. 9, 1935. 471,927.
CONTROL OF CHEMICAL REACTIONS.—Houdry Process Corporation. March 23, 1935. 471,930.
OPERATION OF CATALYTIC CONVERTERS.—Houdry Process Corporation. June 4, 1935. 471,931.
PRODUCTION OF POLY-METHIN-DYESTUFFS.—O. F. Schulz. March 14, 1936. 472,227.
MANUFACTURE OF POLYCYCLIC AROMATIC ALDEHYDES and carboxylic acids.—W. W. Groves (I. G. Farbenindustrie.) March 14, 1936. 472,167.
PROCESS FOR THE MANUFACTURE AND USE OF LIQUID SELF-HARDENING GLAZES derived from synthetic resins.—H. Plauson. July 1, 1935. 471,979.
PROCESS FOR THE MANUFACTURE AND USE OF LIQUID self-hardening compositions derived from synthetic resins.—H. Plauson. Sept. 11, 1935. 472,228.
PROCESS FOR MANUFACTURING PURE COMPOUNDS OF ALUMINIUM.—N. Grunstein. March 16, 1936. 472,229.
MANUFACTURE OF DYESTUFFS.—W. W. Groves (I. G. Farbenindustrie.) March 16, 1936. 472,125.
ARTIFICIAL THREADS AND FIBRES, and products made therefrom. M. W. Perrin, J. G. Paton, E. G. Williams, and Imperial Chemical Industries, Ltd. March 16, 1936. (Cognate Application, 9924/36.) 472,051.
MANUFACTURE OF SUBSTITUTION PRODUCTS OF DIPHENYLENE OXIDE.—W. W. Groves (I. G. Farbenindustrie.) March 17, 1936. 472,170.
MANUFACTURE OF AZO DYESTUFFS FOR WOOL.—A. Carpmael (I. G. Farbenindustrie.) March 17, 1936. 472,171.
PROCESS FOR RENDERING TEXTILE MATERIALS RESISTANT TO CREASING.—Bohme Fettchemie-Ges. Aug. 17, 1935. 471,988.
SYNTHETIC RESINS.—Deutsche Bekleidungsindustrie, Ges. May 11, 1935. 472,066.
MANUFACTURE OF ACETONE CYANHYDRIN.—Deutsche Gold- und Silber-Scheideanstalt vorm. Roessler. June 28, 1935. 471,952.
METHOD OF FACILITATING THE DISPERSION OF PIGMENTS in aqueous emulsions of organic substances containing protein.—Imperial Smelting Corporation, Ltd. July 2, 1935. 472,001.
PRODUCTION OF POROUS COMPOSITIONS.—Dunlop Rubber Co., Ltd., D. F. Twiss, and R. W. Hale. July 2, 1936. 472,193.
PREPARATION OF EMULSIONS.—H. Schou. Aug. 18, 1936. 472,086.
RESPIRATORY PROTECTION APPARATUS.—W. H. A. Thiemann (I. G. Farbenindustrie.) Aug. 24, 1936. 472,088.
PROCESS FOR EXTRACTING CASHEW NUT-SHELL OIL.—W. Jefferies, and Peirce, Leslie, and Co., Ltd. Aug. 28, 1936. 472,195.
EXTRACTION OF CASHEW NUT-SHELL OIL.—W. Jefferies, and Peirce, Leslie, and Co., Ltd. Aug. 28, 1936. 472,196.
SMOKE BOMBS or projectiles.—I. G. Farbenindustrie. Nov. 6, 1935. 472,089.
PRODUCTION OF ACETONE.—H. E. Potts (Shawinigan Chemicals, Ltd.). Sept. 22, 1936. 472,093.
GALVANIC CELL.—Pertrix Chemische Fabrik, A.-G. Oct. 28, 1935. 472,094.
MANUFACTURE OF LECITHIN PREPARATIONS.—C. H. Buer. Nov. 14, 1936. 472,138.
CONVERSION OF HYDROCARBON OILS.—Universal Oil Products Co. June 24, 1935. 471,963.

Specifications Accepted with Date of Application

PROCESS FOR REMOVING BISMUTH from copper mattes.—O. Nielsen, and E. R. Lauber. Dec. 21, 1934. 472,626.
PROCESS AND APPARATUS FOR CARRYING-OUT EXOTHERMIC REACTIONS.—Distillers Co., Ltd., H. Langwell, C. B. Maddocks, and J. F. Short. Jan. 24, 1936. 472,629.
PROCESS OF DYEING.—Aceta Ges. Feb. 21, 1935. 472,630.
MONO-CALCIUM PHOSPHATE.—Victor Chemical Works. March 4, 1935. 472,815.
MANUFACTURE AND PRODUCTION OF MATERIALS containing bituminous substances.—G. W. Johnson (I. G. Farbenindustrie.) Feb. 25, 1936. 472,632.
METHOD OF CARRYING OUT CHEMICAL REACTIONS and extraction processes.—W. W. Groves. March 21, 1935. 472,756.
MANUFACTURE OF CHROMABLE DYESTUFFS of the triarylmethane series.—W. W. Groves (I. G. Farbenindustrie.) March 24, 1936. 472,757.
PREPARATION OF PHOTOGRAPHIC EMULSIONS.—B. Claus. April 5, 1935. 472,639.
TREATMENT OF HYDROCARBONS with chromyl chloride to produce oxidation, chlorination, and polymerisation products of hydrocarbons.—Edeleanu Ges. March 26, 1935. 472,898.
PROCESS FOR THE MANUFACTURE OF ACID WOOL DYESTUFFS of the anthraquinone series.—I. G. Farbenindustrie. March 26, 1935. 472,652.
PROCESS FOR THE MANUFACTURE OF COMPOSITIONS comprising halogen-containing film forming materials.—A. Carpmael (I. G. Farbenindustrie.) March 26, 1936. 472,653.
MANUFACTURE OF ARYLIDES of 2:3-hydroxynaphthoic acid and of azo dyestuffs therefrom.—W. W. Groves (I. G. Farbenindustrie.) March 27, 1936. 472,823.
MANUFACTURE OF ARTIFICIAL FIBRES suitable for admixture with wool and the dyeing of such mixed goods.—A. Carpmael (I. G. Farbenindustrie.) March 30, 1936. 472,964.
SYNTHETIC RESINS and their manufacture.—E. I. du Pont de Nemours and Co. April 3, 1935. 472,835.
PROCESS FOR THE MANUFACTURE AND PRODUCTION OF ANTI-KNOCK BENZINE by destructive hydrogenation.—H. E. Potts (International Hydrogenation Patents Co., Ltd.). March 31, 1936. 472,691.
SYNTHETIC RESINS and their manufacture.—E. I. du Pont de Nemours and Co. April 3, 1935. 472,913.

Chemical and Allied Stocks and Shares

MOST sections of the stock and share markets have been subjected to forced liquidation this week, the belief having gained ground that, pending improvement in international affairs and a better tendency in New York markets, it is likely the industrial and other departments of the Stock Exchange may continue to show an uncertain trend. As is usual when forced liquidation is in evidence, selling centred on the good class and easily marketable securities. This explains the heavy declines shown this week by many leading shares, such as Imperial Chemical Industries and Distillers. Later there was partial recovery in share values generally, but the tone of markets remained unsettled.

Despite favourable views as to dividend prospects, Imperial Chemical show a decline on the week from 37s. 3d. to 35s. 9d., while Distillers have reacted from 108s. 3d. to 103s. 9d. at the time of writing. Unilever were subject to selling from the Continent and are 34s. 9d., compared with 40s. a week ago. There was a setback in United Molasses from 28s. 0½d. to 25s. 3d., while Triplex Safety Glass are 51s., compared with 52s. 3d. Imperial Smelting were unchanged at 14s. 9d., despite the resumption of dividends, which had not been generally expected in the market. Had general conditions been less depressed it is possible the price would have responded to the dividend decision. International Combustion were done at the lower price of 105s., and lower prices were again made by Associated Portland Cement and British Plaster Board, despite expectations that the latter company is likely to maintain its forthcoming interim dividend at 20 per cent. General Refractories lost 6d. to 24s., while Borax Consolidated are 28s. 9d. at the time of writing, compared with 30s. a week ago.

A relatively steady tendency was shown by Boots Pure Drug, which, however, are 48s. 3d., against 50s. 6d. a week ago. Timothy Whites and Taylors were aided to some extent by anticipations of a larger dividend, but are 31s. 9d., compared with 33s. 9d. Sangers declined 9d. to 23s. 9d. Fison, Packard are 37s. at the time of writing, assisted by hopes that the dividend will be at least maintained. A week ago the price of 37s. 6d. British Glues, British Industrial Plastics, United Premier Oil and Cake and Lawes Chemical were unchanged.

United Steel failed to hold last week's improvement which followed publication of the very good results, and have moved down to 28s. 9d. Richard Thomas went back to 11s. 9d., although there are anticipations that no change is likely to be made in the interim dividend. Despite the larger capital ranking it continues to be assumed in the market that there are reasonable prospects of the total dividend again being maintained at 15 per cent. Staveley were lower at 59s.

As usual leading oil shares, such as "Shell," have reflected the trend of markets very closely. Anglo-Iranian failed to benefit from the expectations that the forthcoming interim dividend is likely to be kept at 5 per cent. on the enlarged capital arising from the share bonus.

Weekly Prices of British Chemical Products

BUSINESS in general chemicals during the week has been about the average for the season, and although there is no evidence of any outstanding improvement a better tone prevails throughout the market. Quotations for red lead are again lower with the easier situation for the metal, but otherwise there are no price alterations to record for general chemicals, rubber chemicals or wood distillation products. Heavy acids are enjoying a sustained demand and movements in most of the other heavy chemicals are steady with contract deliveries being taken up in fairly substantial quantities. The coal tar section pursues pretty much the same course as reported last week. Supplies of phenol and cresylic acid continue to be short of the market requirements and the interest in these items is mainly concerned with negotiations for forward contracts.

MANCHESTER.—The general uneasiness over the international political situation has hardly been a stimulating influence on the Manchester chemical market during the past week, although the actual effects on trading has been small. There is still a moderate volume of new business going through, whilst, judging from the steady flow of delivery specifications against contracts, there has been little or no falling off in the actual movement of chemicals into consumption in the Lancashire area. With one or two exceptions, mainly those products which have been bearishly affected by the decline in non-ferrous metal prices, the market is on a steady to firm basis. Among the coal-tar products business during the past week has been on a moderate scale, with a certain amount of contract buying going on for delivery over 1938.

General Chemicals

ACETONE.—£45 to £47 per ton.

ACETIC ACID.—Tech., 80%, £28 5s. per ton; pure 80%, £30 5s.; tech., 40%, £15 12s. 6d. to £18 12s. 6d.; tech., 60%, £23 10s. to £25 10s. MANCHESTER: 80%, commercial, £30 5s.; tech. glacial, £42 to £46.

ALUM.—Loose lump, £8 7s. 6d. per ton d/d; GLASGOW: Ground, £10 7s. 6d. per ton; lump, £9 17s. 6d.

ALUMINIUM SULPHATE.—£7 per ton d/d Lancs.; GLASGOW: £7 to £8 ex store.

AMMONIA, ANHYDROUS.—Spot, 1s. to 1s. 1d. per lb. d/d in cylinders. SCOTLAND: 10½d. to 1s. 0½d., containers extra and returnable.

AMMONIA, LIQUID.—SCOTLAND: 80°, 2½d. to 3d. per lb., d/d.

AMMONIUM CARBONATE.—£20 per ton d/d in 5 cwt. casks.

AMMONIUM CHLORIDE.—Grey galvanising, £17 10s. per ton, ex wharf.

AMMONIUM CHLORIDE (MURIATE).—SCOTLAND: British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Salammoniac.)

AMMONIUM DICHROMATE.—8d. per lb. d/d U.K.

ANTIMONY OXIDE.—£68 per ton.

ARSENIC.—Continental material £11 per ton c.i.f., U.K. ports; Cornish White, £12 5s. to £12 10s. per ton f.o.r., mines, according to quantity. SCOTLAND: White powdered, £17 ex store. MANCHESTER: White powdered Cornish £17 10s., ex store.

BARIUM CHLORIDE.—£11 10s. to £12 10s. per ton in casks ex store. GLASGOW: £11 10s. per ton.

BLEACHING POWDER.—Spot, 35/37%, £8 15s. per ton in casks, special terms for contracts. SCOTLAND: £9 per ton net ex store.

BORAX COMMERCIAL.—Granulated, £16 per ton; crystal, £17; powdered, £17 10s.; extra finely powdered, £18 10s., packed in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. GLASGOW: Granulated, £16, crystal, £17; powdered, £17 10s. per ton in 1-cwt. bags, carriage paid.

BORIC ACID.—Commercial granulated, £28 10s. per ton; crystal, £29 10s.; powdered, £30 10s.; extra finely powdered, £32 10s. in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. GLASGOW: Crystals, £29 10s.; powdered, £30 10s. 1-cwt. bags in 1-ton lots.

CALCIUM BISULPHITE.—£6 10s. per ton f.o.r. London.

CHARCOAL, LUMP.—£6 to £6 10s. per ton, ex wharf. Granulated, £7 to £9 per ton according to grade and locality.

CHROMETAN.—Crystals, 2½d. per lb.; liquor, £19 10s. per ton d/d. station in Drums. GLASGOW: 70/75% solid, £5 15s. per ton net ex store.

CHROMIC ACID.—9¼d. per lb., less 2½%; d/d U.K.

CITRIC ACID.—1s. 0¼d. per lb. MANCHESTER: 1s. SCOTLAND: B.P. crystals, 1s. 0¼d. per lb., less 5%, ex store.

COPPER SULPHATE.—£21 7s. 6d. per ton, less 2% in casks. MANCHESTER: £20 10s. per ton f.o.b. SCOTLAND: £22 10s. per ton, less 5%, Liverpool, in casks.

CREAM OF TARTAR.—100%, 92s. per cwt., less 2½%. GLASGOW: 99%, £4 12s. per cwt. in 5-cwt. casks.

FORMALDEHYDE.—£22 10s. per ton.

FORMIC ACID.—85%, in carboys, ton lots, £42 to £47 per ton.

GLYCERINE.—Chemically pure, double distilled, 1.260 s.g., in tins, £5 7s. 6d. to £6 7s. 6d. per cwt. according to quantity; in drums, £5 to £5 13s. 6d.

HYDROCHLORIC ACID.—Spot, 5s. to 7s. 6d. carboy d/d according to purity, strength and locality.

IODINE.—Resublimed B.P., 6s. 4d. per lb. in 7 lb. lots.

LACTIC ACID.—(Not less than ton lots) Dark, 50% by volume, £23 10s.; by weight, £27 10s.; Pale, 50% by volume, £27; by weight, £32 per ton. LANCASHIRE: Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £50; pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £55; edible, 50%, by vol., £41. One-ton lots ex works, barrels free.

LEAD ACETATE.—LONDON: White, £31 10s. ton lots; brown, £35. GLASGOW: White crystals, £35 10s.; brown, £1 per ton less. MANCHESTER: White, £36; brown, £35.

LEAD NITRATE.—£39 per ton.

LEAD, RED.—£33 15s. per ton, less 2½% carriage paid. SCOTLAND: £34 per ton, less 2½%, carriage paid for 2-ton lots.

LITHARGE.—SCOTLAND: Ground, £34 per ton, less 2½%, carriage paid for 2-ton lots.

MAGNESITE.—SCOTLAND: Ground calcined, £9 per ton, ex store.

MAGNESIUM CHLORIDE.—SCOTLAND: £7 10s. per ton.

MAGNESIUM SULPHATE.—Commercial, £5 10s. per ton, ex wharf.

MERCURY.—Ammoniated B.P. (white precip.), lump, 5s. 11d per lb.; powder B.P., 6s. 1d.; bichloride B.P. (corros. sub.) 5s. 2d.; powder B.P. 4s. 10d.; chloride B.P. (calomel), 5s. 11d.; red oxide cryst. (red precip.), 7s.; levig. 6s. 6d.; yellow oxide B.P. 6s. 4d.; persulphate white B.P.C., 6s. 1d.; sulphide black (hyd. sulph. cum sulph. 50%), 6s. For quantities under 112 lb., 1d. extra.

METHYLATED SPIRIT.—61 O.P. industrial, 1s. 5d. to 2s. per gal.; pyridinised industrial, 1s. 7d. to 2s. 2d.; mineralised, 2s. 6d. to 3s. Spirit 64 O.P. is 1d. more in all cases and the range of prices is according to quantities. SCOTLAND: Industrial 64 O.P., 1s. 9d. to 2s. 4d.

NITRIC ACID.—80° Tw. spot, £16 10s. per ton makers' works.

OXALIC ACID.—£48 15s. to £57 10s. per ton, according to packages and position. GLASGOW: £2 9s. per cwt. in casks. MANCHESTER: £49 to £54 per ton ex store

PARAFFIN WAX.—SCOTLAND: 3¾d. per lb.

POTASH CAUSTIC.—Solid, £35 5s. to £36 15s. per ton for 2-ton lots ex store; broken, £42 per ton. MANCHESTER: £39.

POTASSIUM CHLORATE.—£36 7s. 6d. per ton. GLASGOW: 4¼d. per lb. MANCHESTER: £38 per ton.

POTASSIUM DICHROMATE.—SCOTLAND: 5d. per lb., net, carriage paid.

POTASSIUM IODIDE.—B.P. 5s. 6d per lb. in 7 lb. lots.

POTASSIUM NITRATE.—£27 per ton. GLASGOW: Refined granulated, £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.

POTASSIUM PERMANGANATE.—LONDON: 9¾d. per lb. SCOTLAND: B.P. Crystals, 9¾d. MANCHESTER: B.P. 10¾d. to 1s.

POTASSIUM PRUSSIATE.—6½d. per lb. SCOTLAND: 7d. net, in casks, ex store. MANCHESTER: Yellow, 6½d.

SALAMMONIAC.—Dog-tooth crystals, £36 per ton, fine white crystals, £16 10s. per ton, in casks, ex store. GLASGOW: Large crystals, in casks, £37 10s.

SALT CAKE.—Unground, spot, £3 to £3 10s. per ton.

SODA ASH.—58% spot, £5 12s. 6d. per ton f.o.r. in bags.

SODA, CAUSTIC.—Solid, 76/77° spot, £12 10s. per ton d/d station. SCOTLAND: Powdered 98/99%, £18 10s. in drums, £19 5s. in casks, Solid 76/77° £15 12s. 6d. in drums; 70/73%, £15 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts, 10s. per ton less.

SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.

SODIUM ACETATE.—£18 per ton carriage paid North. GLASGOW: £18 per ton net ex store.

SODIUM BICARBONATE.—Refined spot, £10 10s. per ton d/d station in bags. GLASGOW: £13 5s. per ton in 1 cwt. kegs, £11 5s. per ton in 2-cwt. bags. MANCHESTER: £10 10s.

SODIUM BISULPHITE POWDER.—60/62%, £20 per ton d/d 1 cwt. iron drums for home trade.

SODIUM CARBONATE MONOHYDRATE.—£15 5s. per ton d/d in minimum ton lots in 2 cwt. free bags.

SODIUM CHLORATE.—£26 10s. to £30 per ton. GLASGOW: £1 10s. per cwt., minimum 3 cwt. lots.

SODIUM CHROMATE.—4d. per lb. d/d U.K.

SODIUM DICHROMATE.—Crystals cake and powder 4d. per lb. net d/d U.K. discount 5%. MANCHESTER: 4d. per lb. GLASGOW: 4d., net, carriage paid.

SODIUM HYPOSULPHITE.—Pea crystals, £14 10s. per ton for 2-ton lots; commercial, £11 5s. per ton. MANCHESTER: Commercial, £11; photographic, £15 10s.

SODIUM METASILICATE.—£14 per ton, d/d U.K. in cwt. bags.

SODIUM NITRATE.—Refined, £8 per ton for 6-ton lots d/d.

SODIUM NITRITE.—£18 5s. per ton for ton lots.

SODIUM PERBORATE.—10%, 9¼d. per lb. d/d in 1-cwt. drums.

SODIUM PHOSPHATE.—£10 10s. to £11 per ton delivered (Di-basic).

SODIUM PRUSSIATE.—½d. per lb. for ton lots. GLASGOW: 5d. to 5¾d. ex store. MANCHESTER: 4d. to 4¾d.
SODIUM SILICATE.—£9 10s. per ton.
SODIUM SULPHATE (GLAUBER SALTS).—£3 per ton d/d.
SODIUM SULPHATE (SALT CAKE).—Unground spot, £3 to £3 10s. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s. per ton d/d. MANCHESTER: £3 12s. 6d.
SODIUM SULPHIDE.—Solid 60/62%, Spot, £11 5s. per ton d/d in drums; crystals 30/32%, £8 15s. per ton d/d in casks. MANCHESTER: Concentrated solid, 60/62%, £11; commercial, £8 10s.
SODIUM SULPHITE.—Pea crystals, spot, £13 10s. per ton d/d sta- of 5 cwt. and upwards. MANCHESTER: 1s. 1½d. per lb.
SULPHUR PRECIP.—B.P., £55 to £60 per ton according to quantity. Commercial, £50 to £55.
SULPHURIC ACID.—168° Tw., £4 11s. to £5 1s. per ton; 140° Tw., arsenic-free, £3 to £3 10s.; 140° Tw., arsenious, £2 10s.
TARTARIC ACID.—1s. 1½d. per lb. less 5%, carriage paid for lots of 5 cwt. and upwards. MANCHESTER: 1s. 1¼d. per lb. GLASGOW: 1s. 1d. per lb.
ZINC SULPHATE.—Crystals, £9 per ton, f.o.r., in bags.

Rubber Chemicals

ANTIMONY SULPHIDE.—Golden, 6½d. to 1s. 1d. per lb., according to quality. Crimson, 1s. 5½d. to 1s. 7d. per lb., according to quality
ARSENIC SULPHIDE.—Yellow, 1s. 5d. to 1s. 7d. per lb.
BARYTES.—£6 to £6 10s. per ton, according to quality.
CADMIUM SULPHIDE.—7s. 8d. to 7s. 11d. per lb.
CARBON BLACK.—4¾d. per lb., ex store.
CARBON DISULPHIDE.—£31 to £33 per ton, according to quantity, drums extra.
CARBON TETRACHLORIDE.—£41 to £46 per ton, according to quantity, drums extra.
CHROMIUM OXIDE.—Green, 1s. 2d. per lb.
DIPHENYLGUANIDINE.—2s. 2d. per lb.
INDIA-RUBBER SUBSTITUTES.—White, 4¾d. to 5½d. per lb.; dark 4d. to 4½d. per lb.
LAMP BLACK.—£28 to £30 per ton del., according to quantity. Vegetable black, £35 per ton upwards.
LEAD HYPOSULPHITE.—9d. per lb.
LITHOPONE.—30%, £16 10s. to £17 5s. per ton.
SULPHUR.—£9 to £9 5s. per ton. SULPHUR PRECIP. B.P., £55 to £60 per ton. SULPHUR PRECIP. COMM., £50 to £55 per ton.
SULPHUR CHLORIDE.—5d. to 7d. per lb., according to quantity.
VERMILLION.—Pale, or deep, 5s. 3d. per lb., 1-cwt. lots.
ZINC SULPHIDE.—£58 to £60 per ton in casks ex store, smaller quantities up to 1s. per lb.

Nitrogen Fertilisers

AMMONIUM SULPHATE.—The following prices have been announced for neutral quality basis 20.6 = nitrogen, in 6-ton lots delivered farmer's nearest station up to June 30, 1938: October, 1937, £7 6s. 6d. per ton; November, £7 8s.; December, £7 9s. 6d.; January, 1938, £7 11s.; February, £7 12s. 6d.; March/June, £7 14s.
CALCIUM CYANAMIDE.—The following prices are for delivery in 5-ton lots, carriage paid to any railway station in Great Britain up to June 30, 1938: October, 1937, £7 8s. 9d. per ton; November, £7 10s.; December, £7 11s. 3d.; January, 1938, £7 12s. 6d.; February, £7 13s. 9d.; March, £7 15s.; April/June, £7 16s. 3d.
NITRO CHALK.—£7 10s. 6d. per ton for delivery up to June 30, 1938.
SODIUM NITRATE.—£8 per ton for delivery up to June 30, 1938.
CONCENTRATED COMPLETE FERTILISERS.—£10 12s. to £11 1s. per ton in 6-ton lots to farmer's nearest station.
AMMONIUM PHOSPHATE FERTILISERS.—£10 5s. to £13 5s. per ton in 6-ton lots to farmer's nearest station.

Coal Tar Products

BENZOL.—At works, crude, 9½d. to 10d. per gal.; standard motor, 1s. 3d. to 1s. 3½d.; 90%, 1s. 4d. to 1s. 4½d.; pure, 1s. 8d. to 1s. 8½d. GLASGOW: Crude, 10d. to 10½d. per gal.; motor, 1s. 4d. to 1s. 4½d.
CARBOLIC ACID.—Crystals, 7¾d. to 8½d. per lb., small quantities would be dearer; Crude, 60's, 4s. to 4s. 3d., dehydrated, 4s. 6d. to 4s. 9d. per gal. MANCHESTER: Crystals, 10½d. per lb. f.o.b. in drums; crude, 4s. 4d. per gal. GLASGOW: Crude, 60's, 4s. 3d. to 4s. 6d. per gal.; distilled, 60's.
CREOSOTE.—Home trade, 6¼d. to 6¾d. per gal., f.o.r. makers' works; exports, 6⅜d. to 6⅝d. per gal., according to grade. MANCHESTER: 5½d. to 6½d. GLASGOW: B.S.I. Specification, 6d. to 6½d. per gal.; washed oil, 5d. to 5½d.; lower sp. gr. oils, 5⅜d. to 6¼d.
CRESYLIC ACID.—97/99%, 5s. to 5s. 2d.; 99/100%, 5s. to 5s. 9d. per gal., according to specification; Pale, 99/100%, 5s. 3d. to 5s. 5d. per gal.; Dark, 95%, 4s. 5d. to 4s. 7d. per gal. GLASGOW: Pale, 99/100%, 5s. to 5s. 6d. per gal.; pale 97/99%, 4s. 6d. to 4s. 10d., dark, 97/99%, 4s. 3d. to 4s. 6d.; high boiling acids, 2s. to 2s. 6d. American specification, 4s. 3d. to 4s. 6d. MANCHESTER: Pale, 99/100%, 4s. 8d.
NAPHTHA.—Solvent, 90/160, 1s. 6½d. to 1s. 7½d. per gal.; solvent, 95/160%, 1s. 8d. to 1s. 9d., naked at works; heavy 90/190%, 1s. 1½d. to 1s. 3d. per gal., naked at works, according to quantity. GLASGOW: Crude, 6½d. to 7½d. per gal.; 90%, 160, 1s. 5d. to 1s. 6d., 90%, 190, 1s. 1d. to 1s. 3d.
NAPHTHALENE.—Crude, whizzed or hot pressed, £9 to £10 per ton; purified crystals, £18 per ton in 2-cwt. bags. LONDON: Fire lighter quality, £5 10s. to £7 per ton. GLASGOW: Fire lighter, crude, £6 to £7 per ton (bags free). MANCHESTER: Refined, £19 per ton f.o.b.
PITCH.—Medium, soft, 38s. per ton, f.o.b. MANCHESTER: 37s. f.o.b., East Coast. GLASGOW: f.o.b. Glasgow, 35s. to 37s. per ton; in bulk for home trade, 35s.
PYRIDINE.—99/140%, 12s. to 14s. per gal.; 90/160%, 11s. to 11s. 6d. per gal.; 90/180%, 3s. to 3s. 6d. per gal., f.o.b. GLASGOW: 90% 140, 10s. to 12s. per gal.; 90% 160, 9s. to 10s.; 90% 180, 2s. 6d. to 3s. MANCHESTER: 11s. to 12s. 6d. per gal.
TOLUOL.—90%, 1s. 11d. per gal.; pure, 2s. 5d. GLASGOW: 90%, 120, 1s. 10d. to 2s. per gal.
XYLOL.—Commercial, 2s. 3d. per gal.; pure, 2s. 5d. GLASGOW: Commercial, 2s. to 2s. 1d. per gal.

Wood Distillation Products

CALCIUM ACETATE.—Brown, £8 to £8 10s. per ton; grey, £10 10s. to £11 10s. Liquor, brown, 30° Tw., 6d. to 8d. per gal. MANCHESTER: Brown, £9 10s.; grey, £11 10s.
METHYL ACETONE.—40-50%, £42 to £45 per ton.
WOOD CREOSOTE.—Unrefined 6d. to 9d. per gal., according to boiling range.
WOOD, NAPHTHA, MISCIBLE.—2s. 8d. to 3s. 3d. per gal.; solvent, 3s. 6d. to 3s. 9d. per gal.
WOOD TAR.—£3 to £8 per ton, according to quality.

Intermediates and Dyes

ANILINE OIL.—Spot, 8d. per lb., drums extra, d/d buyer's works.
ANILINE SALTS.—Spot, 8d. per lb. d/d buyer's works, casks free.
BENZIDINE, HCl.—2s. 5d. per lb., 100% as base, in casks.
BENZOIC ACID, 1914 B.P. (ex toluol).—1s. 9½d. per lb. d/d buyer's works.
m-CRESOL 98/100%.—1s. 8d. to 1s. 9d. per lb. in ton lots.
o-CRESOL 30/31° C.—6½d. to 7½d. per lb. in 1-ton lots.
p-CRESOL, 34-5° C.—1s. 7d. to 1s. 8d. per lb. in ton lots.
DICHLORANILINE.—1s. 11½d. to 2s. 3d. per lb.
DIMETHYLANILINE.—Spot, 1s. 6d. per lb., package extra.
DINITROBENZENE.—7½d. per lb.
DINITROCHLORBENZENE, SOLID.—£72 per ton.
DINITROTOLUENE.—48/50° C., 8½d. per lb.; 66/68° C., 10d.
DIPHENYLAMINE.—Spot, 2s. per lb., d/d buyer's works
GAMMA ACID.—Spot, 4s. per lb. 100% d/d buyer's works.
H ACID.—Spot, 2s. 4½d. per lb. 100% d/d buyer's works.
NAPHTHIONIC ACID.—1s. 8d. per lb.
α-NAPHTHOL.—Spot, 2s. 4d. per lb., d/d buyer's works.
β-NAPHTHOL.—9½d. to 9¾d. per lb.; flake, 9½d. to 9¾d.
a-NAPHTHYLAMINE.—Lumps, 1s. per lb.; ground, 1s. 0½d. in casks.
β-NAPHTHYLAMINE.—Spot, 2s. 9d. per lb., d/d buyer's works.
NEVILLE AND WINTHER'S ACID.—Spot, 3s. per lb. 100%.
o-NITRANILINE.—3s. 11d. per lb.
m-NITRANILINE.—Spot, 2s. 7d. per lb. d/d buyer's works.
p-NITRANILINE.—Spot, 1s. 8d. to 2s. 1d. per lb. d/d buyer's works.
NITROBENZENE.—Spot, 4½d. to 5d. per lb., in 90-gal. drums, drums extra. 1-ton lots d/d buyer's works.
NITRONAPHTHALENE.—9d. per lb.; P.G., 1s. 0½d. per lb.
SODIUM NAPHTHIONATE.—Spot, 1s. 9d. per lb., 100% d/d buyer's works.
SULPHANILIC ACID.—Spot, 8d. per lb. 100%, d/d buyer's works.
o-TOLUIDINE.—10½d. per lb., in 8/10-cwt. drums, drums extra.
p-TOLUIDINE.—1s. 10½d. per lb., in casks.
m-XYLIDINE ACETATE.—4s. 3d. per lb., 100%.

Books Received

A Text-Book of Qualitative Chemical Analysis. By Arthur I. Vogal. Pp. 383. London: Longmans, Green and Co. 7s. 6d.

Metallography. By C. H. Desch. 4th Edition. Revised and enlarged. Pp. 402. London: Longmans, Green and Co. 21s.

A Short History of Chemistry. By J. R. Partington. Pp. 386. London: Macmillan and Co. 7s. 6d.

A Scheme of Inorganic Qualitative Analysis. By E. M. Stoddart. Pp. 39. London: William Heinemann, Ltd. 1s. 6d.

Perspectives in Biochemistry. Edited by Joseph Needham and David E. Green. Pp. 361. Cambridge: University Press. 15s.

Man in a Chemical World. By A. Cressy Morrison. Pp. 292. New York: Charles Scribners, Sons, Ltd. 12s. 6d.

Potash Deficiency Symptons. By Professor Oskar Eckstein, Albert Bruno and Dr. J. W. Turrentine. Pp. 234. Berlin: Verlagsgesellschaft für Ackerban m.b.H.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Satisfactions

NEW HYGIENE, LTD. (formerly Lipton's Spray Products, Ltd.), London, W.C. (M.S., 16/9/37.) Chemical manufacturers. Satisfaction September 30, £250, registered March 6, 1936.

H. C. RYLAND AND SON, LTD., Richmond (Surrey). (M.S., 16/9/37.) Scientific instrument manufacturers. Satisfaction October 6, of charge registered June 5, 1935.

Voluntary Liquidation

CHARLES and CO., LTD., soap manufacturers, Holbeck, Leeds.—The statutory meeting of creditors was held recently at Leeds, when the statement of affairs showed unsecured creditors of £1,853, of which £1,474 was expected to rank. The assets were £123, or a deficiency of £1,350, so far as the creditors were concerned. The issued capital was £5,000, and as regarded the shareholders there was a deficiency of £6,350. The company was registered in 1910 with a nominal capital of £1,000, subsequently increased by £4,000 in the form of cumulative preference shares carrying 10 per cent. interest. On May 24 last a receiver was appointed on behalf of the debenture holders—the bankers. The latter held a debenture which was issued to them in 1920 for £2,000, and the amount then outstanding was £1,314. The directors had made every effort to sell the business as a going concern; the receiver for the debenture holders had also endeavoured to do so, but could not find a purchaser. Resolutions were passed confirming the appointment of Mr. F. C. Mair as liquidator.

Company News

Olympic Portland Cement has announced an interim of 2½ per cent., less tax (same).

Cellon, Ltd., manufacturers of aeroplane dopes, cellulose lacquers, etc., have announced an interim of 7½ per cent., less tax (same).

Amal, Ltd., manufacturers of carburetters, etc., controlled by Imperial Chemical Industries, announces a dividend of 10 per cent. on the ordinary and a bonus of 5 per cent., making 15 per cent., less tax (10 per cent.).

Drug Houses of Australia has announced net profits of £174,520 for the year ended June 30 (£147,107); interim of 3 per cent. already paid in respect of current year. Last year's distributions amounted to 6 per cent.

Genatosan, Ltd., manufacturers of Sanatogen, Genasprin, etc., controlled by Anglo-Continental Guano Works, in their report for the year ended June 30, 1937, show a net profit of £67,654 (£65,357); add £15,478 brought in. Final dividend 20 per cent., making 35 per cent., less tax (same); expenditure on dental and other preparations written off £10,000 (same); forward £19,085. Meeting, Winchester House, London, E.C.2, November 1.

Rio Tinto Co., Ltd., announces the half-year's dividend of 2s. 6d. per share, less tax, on the £1,625,000 of 5 per cent. preference shares. Payment will be made on November 1 next. No dividend has been paid on the £2,125,000 of ordinary shares since 1930, when 20 per cent. was distributed. The company owns copper and sulphur mines and railways in Spain. Its investments are principally in Rhodesian copper undertakings, the most substantial being in Rhokana Corporation, Ltd.

Erinoid, Ltd., manufacturers of non-inflammable and non-conducting materials, show trading profit of £31,872 (£40,786) for the year ended July 31. After deducting depreciation, etc., net profit amounts to £23,075 (£31,752). To tax reserve £5,666 (£7,559); final ordinary dividend 5 per cent., making 8 per cent. (10 per cent.), less tax; forward £4,846 (£6,433). The report adds that two new processes are being developed to produce materials for which there is a wide and stable market.

Imperial Smelting Corporation, Ltd., which owns the whole of the share capital of the National Smelting Co., has returned to the dividend list after a lapse of six years. The directors have resolved to recommend to the shareholders at the forthcoming annual meeting a dividend of 5 per cent., less tax, on the ordinary shares for the year ended June 30, 1937. This is the first payment to be made since 1930, when a similar dividend was paid for a period of eleven months. Report and accounts will be posted towards the end of October.

British Celanese, Ltd., have announced that the half-year's dividend on the £2,500,000 7 per cent. first cumulative preference shares will be paid on the due date, October 30, to holders registered at the close of business on October 14. The board has also had under consideration the question of a dividend on the £1,250,000 7½ per cent. participating second cumulative preference shares, but a preliminary review of the accounts for the year ended July 30 last indicates that, while a year's dividend on the first preference shares has been earned with a substantial margin, this margin is insufficient to justify the payment of a dividend on the second preference shares. This matter will be dealt with further in the directors' report, which will be issued by the end of October.

Forthcoming Events

Hull.

October 19.—Hull Chemical and Engineering Society at Municipal Technical College, Park Street, at 7.45 p.m. J. A. Doorat, "Progress in Electric Arc Welding."

London.

October 20.—Electrodepositors' Technical Society at the Northampton Polytechnic Institute, St. John Street, Clerkenwell, E.C.1, at 8.15 p.m. Dr. T. P. Hoare, "The Application of Some Corrosion Principles to Problems in Electrodeposition."

October 21.—The Chemical Society at Burlington House, Piccadilly, W.1, at 8 p.m. Ordinary Scientific Meeting. Institute of the Plastics Industry at the Lecture Theatre, Science Museum, South Kensington, S.W.7, at 7.15 p.m. Annual general meeting and presidential address.

October 22.—British Association at the Royal Institution, 21 Albemarle Street, W.1, Ramsay MacDonald, M.P., Radford Mather Lecture, "Science and Community."

Bristol.

October 21.—Institute of Chemistry (Bristol and South-Western Counties Section), at the Chemical Department of the University, at 5.30 p.m. Richard B. Pilcher, "From Boyle to Priestley."

Aberdeen.

October 22.—Institute of Chemistry (Aberdeen and North of Scotland Section), at the Chemistry Department, Marischal College, at 5.15 p.m., Dr. R. B. Strathdee, "An Introduction to the Chemistry of Phenanthrene."

Glasgow.

October 22.—The Chemical Society at the Royal Technical College, 204 George Street, at 7.30 p.m. J. D. Bernal, "Systematic Theory of the Liquid State."

Newcastle.

October 25.—Bedson Club (Newcastle-on-Tyne), at the Chemistry Lecture Theatre, King's College, at 6.30 p.m. Professor G. J. Finch, "Electron Diffraction on Surfaces."

Leeds.

October 26.—Society of Chemical Industry. J. E. Such, "The Use of Phosphates." H. Whittaker, "The Bower-Barff Process."

Cardiff.

October 22.—Institute of Chemistry (Cardiff and District Section). Joint meeting with the Technical College Chemical Society and the Chemical Society, at 5 p.m. Professor A. Paneth, "The Stratosphere."

New Companies Registered

F. R. Dawson (Squares), Ltd., 16 Rodney Street, Wigan.—Private company. Registered October 7. Capital £3,000 in 3,000 ordinary shares of £1 each. To carry on the business of manufacturing chemists. Directors are: Robert H. Dawson, John F. S. Dawson, and Mary A. Dawson, Crossdale House, Parbold, near Wigan.

Lancaster Paint and Varnish Co., Ltd.—Registered September 29. Capital, £2,000 in 2,000 shares of £1 each. To carry on the business of manufacturers of and dealers in paints, varnishes, enamels, polishes, etc. Directors: Fdk. W. Jones, "Crabtrees," Brindle, near Chorley (director of Leyland Paint and Varnish Co., Ltd.); Fred. A. Bland; Arthur E. Jones; Harry Walsh. Registered Office: 78 Penny Street, Lancaster.

Hommel-Berg, Ltd.—Registered as "private" company September 27. Nominal capital £25,000 in 15,000 7 per cent. cumulative preference shares of £1 each and 200,000 ordinary shares of 1s. each. To carry on the business of manufacturers of and dealers in all kinds of complete carbonisation plants for coal, torbanite, slate, peat, wood or any other material suitable for carbonisation or gasification, plants for the complete conversion of coal into oils via gas synthesis or hydrogenation, or any other process, etc. Subscribers: John S. Harrison, "Euclid," Rusper Road, Ifield, Sussex; Angus Gilchrist.

Chemical Trade Inquiries

The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).

Belgium.—An agent established at Brussels wishes to obtain the representation of United Kingdom manufacturers of pharmaceutical and veterinary products. Agency would be on a commission basis, plus expenses for publicity, etc. (Ref. No. 246.)

Canada.—A firm of manufacturers' agents established at Toronto wish to obtain the representation on a commission and/or purchasing basis, for Eastern Canada, of United Kingdom distillers of fatty acids such as cotton seed, soya bean, rice oil, coconut, linseed, sunflower, tall oil, sperm oil, palm oil, red oil and white oleine. (Ref. No. 238.)